TECHNICAL SYSTEM AUDIT
OF THE
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD
2007

Conducted by US EPA Region 9

June 2008

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EXECUTIVE SUMMARY

In accordance with Federal regulations at 40 CFR Part 58, Appendix A, EPA Regional offices are required to conduct Technical System Audits (TSA) of each Primary Quality Assurance Organization at least once every three years. This report presents the findings of the TSA of the ARB monitoring program conducted in the summer of 2007.

A TSA is one of the ways that EPA provides oversight to ensure that data collected by state and local agencies meets certain minimum data quality objectives. Other assessments such as network reviews and performance evaluations are also used to collect information on the overall quality of ambient air monitoring data. These assessments also enable agencies to identify and correct those program elements which may be adversely affecting the quality of ambient air data.

A Primary Quality Assurance Organization (PQAO) is a monitoring organization or a coordinated aggregation of such organizations that is responsible for a set of stations that monitors the same pollutant and for which data quality assessments can logically be pooled. Each criteria pollutant sampler/monitor at a monitoring station in the SLAMS network must be associated with one, and only one, PQAO.[1] The term PQAO is a new term established in EPA's revised monitoring regulations promulgated on October 17, 2006. Previously the term "reporting organization" was used to describe agencies that combined data quality assessments.

The California Air Resources Board (ARB), part of the California Environmental Protection Agency, is the governmental agency delegated under State law with the authority and responsibility for collecting ambient air quality data as directed by the Clean Air Act of 1977 and Clean Air Act Amendments of 1990. The ARB and local Air Pollution Control Districts (Districts) operate ambient monitoring stations throughout the State. The ARB is the designated PQAO for the entire State with the exception of the ambient air monitoring programs of the Bay Area Air Quality Management District, the South Coast Air Quality Management District, and the San Diego Air Pollution Control District.[2] Many of the smallest local Districts do not have active air monitoring programs and rely solely on ARB for the operation of monitoring stations within their jurisdictions.

The EPA Region 9 audit team interviewed the ARB management and staff on various aspects of the air monitoring program including network design, field operations, laboratory operations, data handling, quality assurance and quality control procedures. Since ARB oversees the quality assurance of data collected by local Districts[3] within the ARB PQAO, we also reviewed field operations, data management and quality assurance

[1] 40 CFR 58, Appendix A, section 3.1

[2] State of California, Air Resources Board, Air Monitoring Quality Assurance, Volume I, Quality Assurance Plan, Monitoring and Laboratory Division, June 2005, Section 1.0.2.2

[3] There are 32 local Districts that are part of the ARB PQAO. According to the California State and Local Air Monitoring Network Plan - 2007, prepared by the ARB's Planning and Technical Support Division, Air Quality Data Branch in June 2007, 22 local Districts operate air monitoring stations in the ARB PQAO.

activities at a representative sample of local Districts. For this TSA, it was not possible for EPA to evaluate all of the 22 local Districts that collect ambient air quality data; therefore, the EPA audit team reviewed operations at three representative local Districts, the San Joaquin Valley Air Pollution Control District, the Great Basin Unified Air Pollution Control District, and the Northern Sierra Air Quality Management District.

The local Districts included in the ARB PQAO have their own organizational structures and these will vary depending on the size of the local district program. The San Joaquin Valley Air Pollution Control District was chosen for review because it is the largest local District in the ARB PQAO and has the most significant air quality issues. Great Basin Unified Air Pollution Control District was chosen as an example of a medium size organization but also because of the unique air quality problems that exist in their air basin. Finally, the Northern Sierra Air Quality Management District was chosen to be representative of the small Districts and also because, with the tightening of the National Ambient Air Quality Standards for PM2.5 and ozone, the mountain counties air basin is beginning to face air quality nonattainment issues for the first time.

The major findings of this TSA pertain to the ARB's role as a PQAO. One of the most important elements in the implementation of an air monitoring program is documentation. Appropriate documentation includes, but is not limited to, standard operating procedures for all aspects of an organization's program, data quality assessments, logbooks tracking actual day-to-day operations, and records of quality control and maintenance checks. Oversight of personnel and activities involved in the collection, processing and submittal of data is much more straightforward when procedures are standardized and responsible personnel record their compliance with these procedures. The ARB's internal monitoring program is both well organized and well maintained, and generally meets or exceeds EPA monitoring requirements. However, our review of the local District programs shows that the ARB, in its role as a PQAO for most local Districts, does not fully meet EPA requirements. Specifically, information collected through this TSA indicates that the ARB is not fulfilling its oversight role as the PQAO. Examples include:

- The ARB PQAO does not have sufficient controls in place to ensure that local Districts follow consistent procedures and produce data of similar quality.
- The ARB PQAO does not have support of common management, headquarters, or laboratory facilities, with the exception of some analytical laboratory analysis performed by the MLD laboratory for some Districts.
- There is no central organization that ensures Districts are aware of and follow changes to the QA Manual and related SOPs.
- Districts that are part of the ARB PQAO collect data for EPA decision making and/or funded by EPA that is not quality assured by the ARB PQAO.

Generally, the findings presented in a TSA are followed with recommendations to address the stated finding. In the case of this TSA, many of the major findings contained in this report do not include a recommendation. This is because in some instances we believe it is more appropriate to discuss the findings with the ARB management and

arrive at a mutually agreeable corrective action. For these most significant, overarching findings, we expect solutions to involve a coordinated effort between the ARB, the local Districts within the ARB's PQAO, and EPA Region 9. On the other hand, where possible and appropriate, recommendations are provided to give some indication of the Region's expectations as to how findings can be addressed. If the ARB has other approaches or alternatives to address the concerns identified, EPA will consider them, provided the corrective action adequately addresses the finding. In general, the findings and recommendations in this report are listed in priority order. Finally, it is important to note that the findings in this TSA are not intended to be used to validate or invalidate ambient air quality data.

EPA would like to thank all the staff and management of the ARB for their support and cooperation during this audit.

INTRODUCTION

In the summer of 2007, EPA Region 9 conducted a Technical System Audit (TSA) of the ambient monitoring program operated by and overseen by the ARB. The ambient air monitoring program in the State of California encompasses many air quality assessment activities including collecting and analyzing data for the Federal criteria pollutants and many other air pollutants of concern, collecting data from special studies as directed by the Board, determining which monitoring methods are used by the State and local air districts, (in compliance with Federal and State regulations), conducting annual performance audits of all monitoring equipment within its PQAO, implementation of a program to calibrate and certify measurement standards, and conducting training in the operation of ambient air monitoring instruments.

EPA staff interviewed management and staff in three branches of the ARB Monitoring and Laboratory Division (MLD) and one branch of the Planning and Technical Support Division (PTSD). The TSA covered the areas of Air Monitoring Network Management, Field Operations, Laboratory Operations, Data and Data Management, and Quality Assurance. In addition, the EPA staff reviewed these same areas as implemented by three local Districts: the San Joaquin Valley Air Pollution Control District, the Great Basin Unified Air Pollution Control District, and the Northern Sierra Air Quality Management District.

The ARB managers and staff were very accommodating to the EPA audit team in making their and their staff's time available for many interviews, procedural reviews and monitoring site visits. Branch Chiefs interviewed were:

Ken Stroud -	Chief, Air Quality Surveillance Branch (AQSB), MLD
Jeff Cook -	Chief, Quality Management Branch (QMB), MLD
Michael Poore -	Chief, Northern Laboratory Branch, MLD
Karen Magliano -	Chief, Air Quality Data Branch (AQDB), PTSD

Many other individual section managers and staff were interviewed in Sacramento and in the field. We appreciate that ARB ensured that the EPA Audit team had access to all key personnel involved in the collection and quality assurance of ambient air quality data.

The EPA regional staff members conducting the TSA were Catherine Brown, Meredith Kurpius and Robert Pallarino of the Air Division’s Technical Support Office and Matthew Plate, Steve Remaley and Roseanne Sakamoto of the Region 9 Quality Assurance Office.

The TSA began with a general meeting with ARB managers and staff on June 7, 2007 at the Monitoring and Laboratory Division office in Sacramento, CA and continued during the months of June, July, and August, 2007. In addition to the EPA Audit Team, Sean Hogan and Eugenia McNaughton, respective Managers of EPA Region 9's

Technical Support Office and Quality Assurance Office attended the opening meeting representing EPA Management.

This report is divided into eight main sections. This first section is an executive summary that describes the purpose of the TSA and a summary of the most significant findings. The next section is an introduction that provides a brief description of the ARB's air monitoring program activities, the EPA audit team, and the report organization. The third section discusses our major findings on the ARB monitoring program as a whole. The remaining five sections address specific aspects of the air monitoring program: network management, field operations, laboratory operations, data management and quality assurance/quality control. Appendix A is a summary listing of the findings contained in this report. Appendix B contains tables summarizing the State's air basins, metropolitan statistical areas, and the minimum monitoring requirements for ozone, PM2.5 and PM10.

MAJOR FINDINGS

Finding M1: The ARB Primary Quality Assurance Organization does not meet the requirements in 40 CFR Part 58, Appendix A, Section 3.1 for its dependent Districts.

Discussion: The ARB Primary Quality Assurance Organization (formerly called "Reporting Organization") does not have sufficient controls in place to ensure that local Districts follow consistent procedures and produce data of similar quality. It appears that the ARB's oversight and its control over the quality of data produced by its dependent Districts does not meet the requirements of 40 CFR 58 and that Districts have become more independent in their data collection activities, either by choice or necessity. Based on our interviews with the ARB staff and management, we believe that a significant contribution to this lessening of the ARB's oversight role is the fact that MLD's budget and staffing levels have been insufficient to support many District activities (such as calibration, standardization, training, data validation, and data reporting). 40 CFR 58, Appendix A notes:

> *3.1 Primary Quality Assurance Organization. A primary quality assurance organization is defined as a monitoring organization or a coordinated aggregation of such organizations that is responsible for a set of stations that monitors the same pollutant and for which data quality assessments can logically be pooled. Each criteria pollutant sampler/monitor at a monitoring station in the SLAMS network must be associated with one, and only one, primary quality assurance organization.*
>
> *3.1.1 Each primary quality assurance organization shall be defined such that measurement uncertainty among all stations in the organization can be expected to be reasonably homogeneous, as a result of common factors. Common factors that should be considered by monitoring organizations in defining primary quality assurance organizations include:*
>
> > *(a) Operation by a common team of field operators according to a common set of procedures;*
> > *(b) Use of a common QAPP or standard operating procedures;*
> > *(c) Common calibration facilities and standards;*
> > *(d) Oversight by a common quality assurance organization; and*
> > *(e) Support by a common management, laboratory or headquarters.*
>
> *3.1.2 Primary quality assurance organizations are not necessarily related to the organization reporting data to the AQS. Monitoring organizations having difficulty in defining the primary quality assurance organizations or in assigning specific sites to primary quality assurance organizations should consult with the appropriate EPA Regional Office. All definitions of primary quality assurance organizations shall be subject to final approval by the appropriate EPA Regional Office during scheduled network reviews or systems audits.*

The ARB PQAO does not have common field operators between the ARB and local Districts. The ARB does offer some training and meetings for field operators, however these are currently not extensive and many Districts do not participate. It was noted that the ARB is developing a training program for ambient air monitoring. This includes four modules, fundamental of air monitoring, station operations, calibration principles, and individual instrument training. These courses will be available to the ARB employees as well as to District personnel.

The ARB PQAO has common procedures available; however, there are no apparent mechanisms or programs in place to ensure that Districts are adopting the same procedures as the ARB. Moreover, the ARB has not developed standard operating procedures for some equipment employed by individual Districts. Although the ARB sometimes inform Districts of procedural changes and problems, the ARB staff indicated that they do not consider themselves obligated to inform Districts of these issues. Many Districts chose not to follow the ARB procedures and Districts that develop and follow their own procedures do not get the ARB approval of them as required in the ARB QA Manual:

> *Section 1.0.2.3: "Unless alternative procedures are submitted in writing to, and approved in writing by the ARB Monitoring and Laboratory Division, the procedures set forth in the ARB Air Monitoring Quality Assurance Manual (Volumes I through VI, as developed) apply to all agencies within the ARB reporting organization."*

The ARB PQAO has a "Standards Laboratory." However, this laboratory is not utilized by most Districts and utilization of the Standards Laboratory is not compulsory. Additionally, the ARB does not track or control in any manner the types of standards used by the Districts.

The ARB PQAO does have common QA oversight in regards to instrument audits and criteria pollutant data evaluation. However, not all instruments are audited and non-criteria pollutant laboratories and projects operated or contracted by the Districts are not routinely overseen by the ARB. Additionally, data validation and internal data corrective actions (not related to audits) are not performed consistently by the Districts and are not a part of the ARB QA system.

The ARB PQAO does not have support of common management, headquarters, or laboratory facilities, with the exception of some analytical laboratory analysis performed by the MLD laboratory for some Districts.

In addition to the CFR requirements discussed above, other complicating factors are that some Districts receive separate monitoring grants from EPA and/or independently report data to AQS. Based on the discussion of the five PQAO criteria, the ARB PQAO does not meet the CFR requirements. Meeting these requirements for some

Districts may be easy to achieve, however others operate with a significant level of independence (e.g. Great Basin AQMD).

Recommendation:

The definition of a PQAO includes five criteria as discussed above. The ARB has proposed a number of actions that would enable them to meet the first two criteria, operation by a common team of field operators according to a common set of procedures and use of a common QAPP or standard operating procedures. The ARB's proposed actions have been incorporated into this recommended corrective action.

To fulfill the requirement that a PQAO demonstrate that monitoring equipment is operated according to a common set of procedures and that all agencies within the ARB PQAO use common QAPPs and SOPs, the ARB Air Quality Surveillance Branch (AQSB) will:

1) Identify a primary monitoring point of contact for each non-ARB district (herinafter 'District') within the ARB PQAO.
2) Provide Districts with SOP's, calibration spreadsheets, data review procedures, maintenance forms and technical bulletins for FRM and FEM analyzers and samplers operated by the ARB. This will be updated annually.
3) Require that each District formally adopt the ARB SOP's calibration spreadsheets, maintenance forms and technical bulletins.
4) Require that each District to notify Chief, AQSB when the relevant materials have been adopted for FRM and FEM devices, or that they do not conduct FRM/FEM air monitoring and periodically update their adoption list.
5) Require that each District to develop SOPs and other relevant documentation for FRM/FEM analyzers and samplers that are not operated by the ARB using the ARB's standardize SOP format. Districts will be requested to submit their SOP's, etc. to ARB for review and approval. Provide each staff person a copy of relevant SOP and ensure it is understood and followed.

Additionally, the ARB has also correctly identified training of operators as necessary to ensure consistency of monitor operations. In addition to the training program mentioned above in the discussion of this finding, the ARB has also proposed that the Chief of the AQSB will:

1) Provide training annually (in Sacramento) on
    a) fundamentals of air monitoring,
    b) principals of calibration,
    c) station operation, and,
    d) instrument specific training, including data validation for that instrument (only for instruments operated by the ARB).

2) Require the Districts to send staff to appropriate training (considering staff's duties) and that the District will provide for staff's travel and per-diem expenses as appropriate.

Regarding the PQAO criterion that agencies within the organization use common calibration facilities and standards, the ARB has proposed that the Chief of the Quality Management Branch (QMB) will:

1) Initiate the Air Quality Data Action (AQDA) process in the ARB's Standard's Laboratory. This process will notify Districts when an instrument fails acceptance criteria for recertification. The AQDA will request an investigation of the problem from the client District.
2) Retain up-to-date records on the source of certification of gas and flow standards for FRM and FEM instruments used by districts in the ARB PQAO. Records indicate there are few if any Districts that do not use the Standard's Lab for criteria pollutant monitoring. QMB/QA staff will conduct a survey to determine the source and ensure NIST traceability is maintained for all FRM and FEM instruments operated by those in the ARB PQAO.

Regarding corrections to data that may be necessary as a result of the data verification and validation process, the ARB has proposed to have the Chief of the AQSB contact Districts that receive an air quality data action (AQDA) that results from an audit and follow-up with the staff in the resolution with training or other technical assistance as needed. Further, the Chief of the Air Quality Data Branch (AQDB) will require that Districts within the ARB PQAO, for which ARB does not submit data, make corrections caused by an AQDA in a timely manner in AQS, and that the Districts submit the required annual certification documentation to the US EPA Region 9 offices, with a "cc" copy sent to the Chief, Air Quality Data Branch.

EPA believes that the ARB needs to take some additional actions to ensure that its own organization, as well as the local Districts in its PQAO, is fully and consistently aware of QA issues in the monitoring program. To that end we propose that the ARB designate a QA lead with defined authority for working with PQAO districts is named for each relevant office in the ARB, e.g. the Air Quality Surveillance Branch, the Northern Laboratory Branch and the Quality Management Branch within the Monitoring and Laboratory Division and the Air Quality Data Branch within the Planning and Technical Services Division. We also recommend that the ARB designate a QA coordinator with responsibility for overseeing QA activities, convening QA working group meetings and reviewing and approving quality documents submitted by the air districts, MLD, and other CARB Divisions. Districts in the ARB PQAO should also designate QA points of contact. To assist the ARB with implementing this recommendation, EPA Region 9 will:

1) Participate in the QA working group meetings in an advisory capacity, taking an oversight role for document review (QMPs, QP Project Plans, including tribal plans);
2) Coordinate with the ARB on district monitoring and quality assurance.
3) Defer and refer to the ARB, questions and issues from districts regarding monitoring conducted that supports the ARB PQAO. This would occur regardless of the district's status as an EPA grantee or data reporting organization.

4) Recommend that districts use the ARB process in place to request the use of alternative methods and equipment.

Finding M2: There is no central organization that ensures Districts are aware of and follow changes to the QA Manual and related SOPs.

Discussion: The ARB MLD branches use the agency website to update documents incorporating operational changes. These changes are not normally communicated to the Districts in the ARB PQAO. To ensure the PQAO is functioning consistently, it should notify all District monitoring staff of changes and, where needed, provide guidance and training on implementing changes, and verify that changes have been implemented or that the procedures used are otherwise equivalent.

Recommendation: As discussed in the recommendation to Finding 1 above, the Chief of the AQSB will take steps and implement procedures to ensure that the ARB and the Districts in its PQAO are all using the same QA and Standard Operating Procedures. The AQSB Chief will achieve this by:

1) Providing Districts with SOP's, calibration spreadsheets, data review procedures, maintenance forms and technical bulletins for FRM and FEM analyzers and samplers operated by the ARB. This will be updated annually.
2) Requesting that each District formally adopt the ARB SOP's calibration spreadsheets, maintenance forms and technical bulletins.
3) Requesting that each District to notify Chief, AQSB when the relevant materials have been adopted for FRM and FEM devices, or that they do not conduct FRM/FEM air monitoring and periodically update their adoption list.
4) Requesting that each District to develop SOPs and other relevant documentation for FRM/FEM analyzers and samplers that are not operated by the ARB using the ARB's standardize SOP format. Districts will be requested to submit their SOP's, etc. to ARB for review and approval. Provide each staff person a copy of relevant SOP and ensure it is understood and followed.

Finding M3: The ARB PQAO has a corrective action process in its QA Manual, but it is not being applied outside the Quality Management Branch (QMB) performance audit program.

Discussion: The QA Manual Volume I defines the ARB's only formal data corrective action as an Air Quality Data Action (AQDA). The definition from Section 1.0.6.3 is:

An Air Quality Data Action (AQDA) is a request for an investigation of the validity of ambient air quality data for a certain period of time. Figure 1.0.6.3 depicts an AQDA request form. AQDA requests can be initiated by any person suspecting erroneous data and serves as a means for withholding questionable air quality data pending further investigation.

AQDA corrective actions were not found to be used outside of the ARB MLD Quality Assurance Section's performance/site audit program. The MLD Air Quality Surveillance Branch has a formal corrective action process beyond the AQDA Process that results in monitoring bulletins being sent out, but this process does not go through independent QA review. The extent to which formal corrective action is taken in the Districts was not determined. However, District corrective action does not routinely go to the ARB MLD for review, and on the occasion when it does (for NAAQS determinations) the process used is not defined.

Recommendation: As discussed in the recommendation to Finding 1 above, the ARB has proposed to have the Chief of the AQSB contact Districts that receive an air quality data action (AQDA) that results from an audit, and follow-up with the staff in the resolution with training or other technical assistance as needed. The Chief of the Air Quality Data Branch will request that Districts within the ARB PQAO, for which ARB does not submit data, make corrections caused by an AQDA in a timely manner in AQS, and that the Districts submit the required annual certification documentation to the US EPA Region 9 offices, with a "cc" copy sent to the Chief, Air Quality Data Branch. Further, the Chief of the QMB will initiate the AQDA process in the ARB's Standard's Laboratory. This process will notify Districts when an instrument fails acceptance criteria for recertification. The AQDA will request an investigation of the problem from the client District.

In addition to the ARB's already existing AQDA process, EPA believes it is necessary to institute additional corrective action procedures to address other aspects of the air quality monitoring program. In the section of this report that addresses Quality Assurance we note in Findings QA4, QA5 and QA6 that the ARB should institute a program of data quality audits, reviews of the MLD's and District data reduction and review procedures, and checks of District generated precision and accuracy data. The ARB needs to develop and implement these additional review procedures and appropriate corrective procedures to be undertaken, if necessary, as a result of these reviews.

Finding M4: The ARB collects environmental data for EPA decision making that is funded in whole or part by EPA but is not subject to the requirements of the ARB and EPA quality assurance programs.

Discussion: EPA grant dollars, in whole or part, are used by the ARB to collect environmental data. However, the ARB does not have a system of centralized Quality Management to ensure that these data, which in some cases are used to support EPA decision-making, meet federal quality assurance requirements. This is contrary to what is reflected in the ARB QA Manual.

The QMB's focus is on monitoring projects which originate in the MLD. The QMB staff was unable to provide the EPA auditors with the details on projects that originate in other ARB Divisions. Furthermore, the QMB does not believe that MLD has any QA responsibility for projects originated by other ARB Divisions, and is disinclined

to apply EPA quality assurance standards to data collected by MLD which is not directly required of MLD by EPA air monitoring regulation.

One specific project with EPA funding, which the MLD QMB has not exercised QA authority over, is the ongoing Lake Tahoe studies. Another project, which the QA Branch is involved with but the QMB staff stated was not relevant to EPA's oversight, is the Lodi diesel emissions study. After reviewing the ARB's 2007 Federal Clean Air Act Section 105 grant work plan, EPA auditors determined it is evident that the Lodi study supports several activities specifically called out under the grant.

All organizations conducting environmental programs funded by EPA are required to establish and implement a quality management system. In accordance with 40 CFR Part 31 and 35, grant recipients are required to document their quality system in a Quality Management Plan through EPA Order 5360.1 A2, Policy and Program Requirements for the Mandatory Agency-wide Quality System (EPA 2000).

Where data is not funded by EPA but is used for EPA decisions (including SIPs and CAA rulemaking) the data must either directly meet the requirements for EPA funded projects in 5360.1 or be acceptable as secondary data by demonstrating validity through quality assurance and/or scientific peer review. This is dictated by requirement 8 of EPA Order 5360.1 A2[4] :

> *(8) Assessment of existing data, when used to support Agency decisions or other secondary purposes, to verify that they are of sufficient quantity and adequate quality for their intended use.*

Where data collection efforts do not include sufficient quality controls to be assessed or peer reviewed, the data should not be used to support EPA decisions.

Recommendation: As part of our recommendation for Finding 1 to institute a QA workgroup for the ARB PQAO, the ARB and EPA will work together to identify special projects that use EPA funding for data collection and ensure that all appropriate and required QA activities are being met.

Finding M5: Districts that are part of the ARB PQAO collect data for EPA decision making and/or funded by EPA that is not quality assured by the ARB PQAO.

Discussion: The Districts that are part of the ARB PQAO collect monitoring data that is not related to the PQAO's activities. These data could be for special projects initiated by individual Districts or for programs dictated by EPA (such as PAMS). Where this data could be used for EPA decision-making or is funded by EPA, the Districts should have independent quality systems and supporting quality assurance plans. This is not always the case. The Districts should make it transparent to EPA and the ARB which monitoring

[4] Policy and Program Requirements for the Mandatory Agency-wide Quality System, Classification No.: 5360.1 A2, May 5, 2000

is intended to be included under the ARB PQAO. Where monitoring is not clearly part of the ARB PQAO responsibilities, the Districts must maintain an appropriate quality assurance system. In the case of EPA funded work, this requires the District to act as a PQAO for the work in question and to submit appropriate QAPPs.

Recommendation: As discussed in Finding 4, all organizations conducting environmental programs funded in whole or part by EPA are required to establish and implement a quality management system. The requirements of EPA Order 5360.1 A2 apply to the Districts within the ARB PQAO as well as to the ARB itself. The QA workgroup discussed in the recommendations to Findings 1 & 5 should also address this issue and ensure that all data collection activities funded in whole or part by EPA meet the appropriate QA requirements.

Finding M6: The ARB QA Manual does not fully meet EPA's QMP and QAPP requirements.

Discussion: The ARB Air Monitoring Quality Assurance Manual is regularly updated and posted on the ARB website for MDL and District staff reference. The QA Manual meets many of the EPA's requirements for Quality Management Plans (QMPs) and Quality Assurance Project Plans (QAPPs). However, some additional information and procedures need to be incorporated into this document. EPA also requests that the ARB formally divide this document into a QMP and QAPPs or provide a crosswalk of how and where the EPA QMP and QAPP requirements have been addressed in a preamble to the document.

The last QA planning documents approved by EPA were a PM2.5 QAPP and the ARB's Quality Assurance Manual in December 1998 and June 1993, respectively. In order to facilitate review, the ARB should formally contact EPA Region 9 any time significant changes are made to the QAM or its attachments so EPA can expeditiously perform reviews.

All organizations conducting environmental programs funded by EPA are required to establish and implement a quality management system. In accordance with 40 CFR Part 31 and 35, grant recipients are required to document their quality system in a Quality Management Plan through EPA Order 5360.1 A2, Policy and Program Requirements for the Mandatory Agency-wide Quality System (EPA 2000). Additionally, requirements specific to ambient air monitoring are found in 40 CFR, Part 58, Appendix A, Section 2.1. Guidance on developing QMPs can be found in the EPA guidance document "EPA Requirements for Quality Management Plans", EPA/240/B-01/002, March 2001.

The US EPA also requires that organizations develop a QAPP for each type of ambient pollutant that is measured. The QAPP integrates all technical and quality aspects of a project, including planning, implementation, and assessment. The purpose of the QAPP is to document planning results for environmental data operations and to provide a project-specific "blueprint" for obtaining the type and quality of environmental data

needed for a specific decision or use. The QAPP documents how quality assurance and quality control are applied to an environmental data operation to assure the results obtained are of the type and quality needed and expected. Further guidance on developing QAPPs can be found in the guidance documents "EPA Requirements for Quality Assurance Project Plans," EPA/240/B-01/003, March 2001, and "Guidance for Quality Assurance Project Plans," EPA/240/R-02/009, December 2002.

Recommendation: As part of the overall reinvigoration of the ARB QA program, the ARB will develop a schedule to update its QA documentation to meet EPA requirements.

Finding M7: Consistent procedures are not used to validate data.

Discussion: In order to maintain a consistent data set, a PQAO should have a consistent standard for routine data validation. However, the QA Manual does not dictate a specific validation scheme for each of the criteria pollutants. This leads to data validation that is inconsistent and has the appearance of being arbitrary. This is of special concern when data are used for NAAQS determination.

Recommendation: See our recommendations to Finding 3 above and to Findings DM1, DM2, DM3, and DM 5.

Finding M8: EPA commends the ARB MLD for producing Quality Assessment Reports and recommends that the ARB PQAO develop a mechanism to use these reports to make specific corrective actions or other quality improvements.

Discussion: The MLD Quality Assurance Section does an excellent job producing reports to assess the overall quality assurance effectiveness of each part of the ARB PQAO. These reports, no doubt, have a positive impact on many of the Districts' performance. However, in order to produce data of consistent quality, the ARB PQAO needs to have a mechanism for systematic evaluation of the practices that lead to both poor and good quality data in order to improve data quality and consistency.

NETWORK MANAGEMENT

Introduction

The purpose of this section is to evaluate the methods and procedures used by the ARB to manage the State's air monitoring network. Our review of the ARB PQAO network is based on the network design criteria contained in 40 CFR 58, Appendix D and the ARB State and Local Air Monitoring Network Plan, prepared annually by the Planning and Technical Support Division of the ARB.

The State network consists of monitoring stations operated by both the ARB and the local Districts. The ARB organizes the State monitoring networks by air basin, of which there are 15 defined in the State. Air basin monitoring networks consist of stations with criteria pollutant monitors designated as State and Local Air Monitoring Stations (SLAMS) monitors, special purpose monitors (SPM), or, in some cases, no designation. For the purposes of our evaluation we treated monitors with no designation as SPMs.

As discussed previously, there are four PQAOs in the State of California: the ARB, the South Coast AQMD, the Bay Area AQMD, and the San Diego APCD. These four organizations operate monitoring networks that provide data for the 15 air basins in the State. The three local PQAOs operate monitoring networks that provide data for three of the 15 State air basins: South Coast, Bay Area, and San Diego County. The ARB PQAO operates multiple monitoring networks that cover the remaining 12 State air basins: Great Basin, Lake County, Lake Tahoe, Mojave Desert, Mountain Counties, North Central Coast, North Coast, Northeast Plateau, Sacramento Valley, Salton Sea, San Joaquin Valley, and South Central Coast. The ARB issues an annual network description which provides details on the monitoring stations throughout the State, including those outside of the ARB PQAO (i.e. monitoring stations operated by the South Coast AQMD, the Bay Area AQMD, and the San Diego APCD). Monitoring stations operated by the National Park Service and some monitoring stations operated by private contractors are also listed in the annual report. The annual report also includes information on monitoring stations in the country of Mexico that are located near the border of California. This annual network description includes not just active monitoring sites but any monitoring site that collected air pollution data in the State of California since the early 1970's.

In some instances, multiple local Districts operate the monitoring networks in a given air basin. Furthermore, the boundaries of metropolitan and micropolitan statistical areas (MSAs), which are established by the US Census bureau, also overlap air basins and local monitoring districts. EPA uses the population statistics of MSAs to determine the minimum SLAMS monitoring requirements for ozone, PM10, and PM2.5[5].

[5] There are no minimum monitoring requirements for the criteria pollutants carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead.

Appendix B at the end of this report provides details on the air basins, MSAs, minimum monitoring requirements and actual number of SLAMS ozone, PM2.5 and PM10 monitors in the ARB PQAO.

We have reviewed the SLAMS monitoring network for the ARB PQAO and have determined that, due to changing population statistics and the tightening of the PM2.5 daily NAAQS, there are a few MSAs which do not meet the minimum monitoring requirements for ozone, PM2.5 and PM10 established by EPA in its regulations at 40 CFR 58, Appendix D. These are addressed in the findings in this section of the report.

Table 1 summarizes the number of SLAMS monitoring sites operated in the ARB PQAO.

TABLE 1: SUMMARY OF SLAMS CRITERIA POLLUTANT MONITORS IN THE ARB PQAO

OPERATING AGENCY	Ozone	CO	NO2	SO2	PM2.5	PM10	TSP Lead
ARB	25	6	14	1	17	22	1
Antelope Valley		1	1		1		
Great Basin Unified APCD					1	11	
Imperial County APCD	2	1			2	5	
Kern County APCD					1	1	
Lake County AQMD	1				1	1	
Mendocino County APCD	2	2	2		1	3	
Mojave Desert AQMD	6	2	3	2	1	4	
Monterey Bay Unified APCD	6	1	2		2	5	
North Coast Unified AQMD					2	2	
Northern Sierra AQMD	2				4	2	
Northern Sonoma County APCD	1					3	
Placer County APCD	2						
Sacramento Metropolitan AQMD	4	3	4	2	2	5	
San Joaquin Valley APCD	11	5	10		5	8	
San Luis Obispo County APCD	5		3	1	1	4	
Santa Barbara County APCD	4	2	3	3		2	
Shasta County AQMD	2				1	2	
Siskiyou County APCD					1		
Tehama County APCD						1	
Ventura County APCD	6		2		4	3	
Yolo-Solano AQMD	2				1		
TOTALS	**81**	**23**	**44**	**9**	**48**	**85**	**1**

Source: California State and Local Air Monitoring Network Plan - 2007, Planning and Technical Support Division, Air Quality Data Branch, June 2007

The SLAMS monitors do not represent all of the criteria pollutant monitors operated in the ARB PQAO. A significant number of criteria pollutant monitors are designated as Special Purpose Monitors or have no designation as summarized in Table 2.

TABLE 2: SUMMARY OF OTHER SPECIAL PURPOSE POLLUTANT MONITORS IN THE ARB PQAO

OPERATING AGENCY	Ozone	CO	NO2	SO2	PM2.5	PM10
ARB	7					2
Antelope Valley	1					
Great Basin Unified APCD						1
Imperial County APCD	3		1		2	5
Mojave Desert AQMD						1
Monterey Bay Unified APCD	2	1	1	1	1	2
North Coast Unified AQMD	1	1	1	1		1
Sacramento Metropolitan AQMD	2	1	1			
San Luis Obispo County APCD						1
Santa Barbara County APCD	4	2	4	2		2
Siskiyou County APCD	1					2
Tehama County APCD	1					1
Yolo-Solano AQMD						3
TOTALS	**22**	**5**	**8**	**4**	**1**	**15**

Source: California State and Local Air Monitoring Network Plan - 2007, Planning and Technical Support Division, Air Quality Data Branch, June 2007

The ARB PQAO also collects data for non-criteria pollutants and meteorological data as summarized in Table 3.

TABLE 3: SUMMARY OF NON-CRITERIA POLLUTANT AND METEOROLOGICAL MONITORING IN THE ARB PQAO

OPERATING AGENCY	Met.	PM2.5 BAM	PM10 TEOM	PM2.5 Spec.	NMHC	NMOC	Toxics	COH	Light Scat.	H2S	THC
ARB	37	18	2	7	3	2	6				
Antelope Valley APCD	1		1								
Great Basin Unified APCD	11		10								
Imperial County APCD	1										
Lake County AQMD	1							1	1		
Mendocino County APCD	4										
Mojave Desert AQMD	5		3		1					1	
Monterey Bay Unified APCD	6	2	2								
North Coast Unified APCD	1										
Northern Sierra AQMD	3		1	1							
North Sonoma County APCD	2										
Sac. Metro. AQMD	8	3	2	4	4				1		
San Joaquin Valley APCD	13	5	3		4	4					
San Luis Obispo County APCD	3		1								
Santa Barbara County APCD	7									1	2
Shasta County AQMD	1	1									
Ventura County APCD	6	4		1	2	2	1				
Yolo-Solano AQMD	3	2									
TOTALS	**113**	**35**	**25**	**13**	**14**	**8**	**7**	**1**	**2**	**2**	**2**

Source: California State and Local Air Monitoring Network Plan - 2007, Planning and Technical Support Division, Air Quality Data Branch, June 2007

The ambient monitoring network in the ARB PQAO has evolved over time and its size, in terms of number of sites and spatial coverage, has generally kept pace with the changing demographics of the State. The individual pollutant networks have been modified over time in response to the change in air pollution problems. For instance the number of sulfur dioxide monitors operated in the State has decreased from a maximum of about 80 monitors in 1990 to its current number of approximately 36[6]. This decrease is reflective of the progress made in reducing the amount of sulfur dioxide air pollution and the subsequent decrease in the need to monitor for this pollutant. All air basins in the State of California are currently in attainment of the sulfur dioxide NAAQS.

In previous years there has been no formal process of network design followed by the agencies that make up the ARB PQAO. The SLAMS monitoring networks in each of 12 air basins in the ARB PQAO consist of monitors operated only by the local District or a combination of monitoring sites operated by the local Districts and the ARB. When a local District wishes to modify a network, e.g. shutting down or relocating an existing

[6] Page 1-3, California State and Local Air Monitoring Network Plan - 2007, Planning and Technical Support Division, Air Quality Data Branch, June 2007. This number includes sulfur dioxide monitors operated by the South Coast AQMD, the Bay Area AQMD, and the San Diego APCD.

site or establishing a new site, they will informally consult with the ARB for feedback on the proposed change.

As a result of changes to EPA monitoring regulations which included more specific requirements for the development and submittal of Annual Network Plans[7], the ARB has developed a questionnaire which will be sent annually to Districts in their PQAO. This questionnaire asks Districts to provide information on how many pollutant monitors they operate, the purpose of each monitor, proposals for upcoming changes to the monitors they operate, a listing of monitors they operate but for which they do not submit data to EPA, and how Districts provide for public review of the local monitoring network. A copy of this questionnaire is included in Appendix C.

Network Management Findings

Finding NM1: The ARB annual network plan includes not just active monitoring sites but any monitoring site that collected air pollution data in the State of California since the early 1970's, whether still in operation or not.

Discussion: The ARB annual network plan includes much useful information on the history of air monitoring in the State and the availability of data. It includes not just information on the criteria pollutant monitors but also non-criteria pollutants of interest and importance. However, while it is informative to know the availability of historic data, EPA believes a separate table or report that only addresses the currently active monitoring stations in the State would be more useful.

Recommendation: Revise the format of the annual network plan to include a table that lists only the active monitoring stations

Finding NM2: The Stockton MSA in the San Joaquin Valley Air Basin does not meet the minimum SLAMS monitoring requirements for PM2.5.

Discussion: In the year 2000, the Stockton MSA had a population of 563,598 people and an estimated 2006 population of 673,170 people. The 2004-2006 annual and daily PM2.5 design values for this MSA, based on data collected at the Stockton Hazelton monitoring site, are 12.9 ug/m3 and 41 ug/m3 respectively. EPA regulations require MSAs with populations between 500,000 and 1,000,000 people and PM2.5 design values greater than 85% of either the annual or daily NAAQS to have a minimum of two PM2.5 monitoring sites designated as SLAMS. There is currently only one PM.5 site in the Stockton MSA, Stockton-Hazelton Street (AQS#06-077-1002) designated as a SLAMS site.

Recommendation: The ARB or the San Joaquin Valley APCD needs to establish an additional PM2.5 SLAMS monitoring site in the Stockton MSA.

[7] See 40 CFR 58.10.

Finding NM3: The Modesto MSA in the San Joaquin Valley Air Basin does not meet the minimum SLAMS monitoring requirements for PM2.5.

Discussion: In the year 2000, the Modesto MSA had a population of 446,997 people. The population of this MSA has grown and the estimated 2006 population was 512,138 people. The 2004-2006 annual and daily PM2.5 design values for this MSA, based on data collected at the Modesto-14th Street monitoring site, are 14.1 ug/m3 and 51 ug/m3 respectively. EPA regulations require MSAs with populations between 500,000 and 1,000,000 people and design values greater than 85% of either the annual or daily NAAQS to have a minimum of two PM2.5 monitoring sites designated as SLAMS sites. There is currently only one PM.5 site in the Modesto MSA, Stockton-14th Street (AQS#06-099-0005) designated as a SLAMS site.

Recommendation: The ARB or the San Joaquin Valley APCD needs to establish an additional PM2.5 SLAMS monitoring site in the Modesto MSA.

Finding NM4: The Red Bluff MSA in the Sacrament Valley Air Basin does not meet the minimum SLAMS monitoring requirements for ozone.

Discussion: In the year 2000, the Red Bluff MSA had a population of 56,039 people. The population of this MSA has grown and the estimated 2006 population was 61,686 people. The 2004–2006 ozone design value for this MSA, based on data collected at a Special Purpose Monitor located in Red Bluff, is 0.072 ppm. EPA regulations require MSAs with populations between 50,000 and 350,000 people and design values greater than 85% of the NAAQS to have a minimum of one ozone monitoring site designated as a SLAMS site. There are currently two ozone sites operating in this MSA, Red Bluff – Oak Street (AQS# 06-103-0005) and Tuscan Butte (AQS# 06-103-0004), however both are designated as Special Purpose Monitoring sites.

Recommendation: The ARB or the Tehama County APCD needs to establish a SLAMS ozone monitoring site in the Red Bluff MSA. This can be accomplished by either establishing a new site or designating the existing Red Bluff – Oak Street site as a SLAMS site. We do not believe the Tuscan Butte site to be an appropriate SLAMS site for this MSA due to its elevation and unique siting characteristics.

Finding NM5: The Visalia-Porterville MSA in the San Joaquin Valley Air Basin does not meet the minimum SLAMS monitoring requirements for ozone.

Discussion: The Visalia-Porterville MSA had a 2000 population of 368,021 people. The population of this MSA has grown and the estimated 2006 population was 419,909 people. The 2004-2006 ozone design value for this MSA, based on data collected at the Visalia-Church Street monitoring site, is 0.092 ppm. EPA regulations require MSAs with populations between 350,000 and 4,000,000 people and design values greater than 85% of the ozone NAAQS to have a minimum of two ozone monitoring sites designated as SLAMS sites. There is currently only one ozone site in the Visalia-Porterville MSA, Visalia-Church Street (AQS#06-107-2002) designated as a SLAMS site.

Recommendation: The ARB or the San Joaquin Valley APCD needs to establish an additional ozone SLAMS monitoring site in the Visalia-Porterville MSA.

Finding NM6: Some information in the ARB State and Local Air Monitoring Network Plan, dated June 2007, does not agree with information in the EPA AQS database or with local district Annual Network Plans. The specific examples noted in the discussion to this finding may or may not constitute the actual total number of inconsistencies in the 2007 plan.

Discussion: In comparing data in the EPA AQS database and the ARB Network Plan, we discovered a number of inconsistencies.

The Grass Valley and Truckee PM10 sites operated by NSAQMD (AQS # 06-057-0005 and 06-057-1001, respectively) collect continuous data that has been reported to AQS through 2006, however ARB's 2007 S&L Monitoring Network Plan indicates that continuous PM10 data for these sites are only available through 2003.

In Glenn County, the Willows-East Laurel Street site (AQS # 06-021-0002) discontinued PM10 operations in September 2006 and was replaced by the Willows-North Colusa Street site (AQS# 06-021-0003). The 2007 S&L Monitoring Network Plan states that the old site continued to collect PM10 data through 2007 and indicates that the new site only collects ozone data.

In San Luis Obispo County, the Carrizo Plains School SLAMS PM10 Monitor (AQS# 06-079-8006) was closed in AQS as of December 31, 2006 yet the 2007 S&L Monitoring Network Plan indicates that data for 2007 is available. The Nipomo-Guadalupe Road PM10 Monitor (AQS# 06-079-2004) is identified as a SLAMS site in the 2007 S&L Monitoring Network Plan, but is not designated as a SLAMS monitor by the San Luis Obispo APCD in their 2007 Ambient Air Monitoring Network Review.

Recommendation: The ARB needs to ensure that the Annual Network Plans accurately reflect the availability of monitoring data, which monitors are currently operational, and that there is agreement between the ARB and local districts as to the designation of sites.

Finding NM7: The ARB 2007 Network Plan is not complete with respect to GBUAPCD sites, monitoring objectives or monitoring scales.

Discussion: Examples of errors in the ARB 2007 Network Plan include:

Dirty Socks is a source-oriented monitor (Owens Lake), however the ARB 2007 Network Plan provides no scale or monitoring objective.

Mono Shores is a source-oriented, maximum concentration site but is listed as urban scale in ARB network plan. For these site types it is unlikely that the monitor is urban scale.

Recommendation: The ARB should allow local Districts an opportunity to review the information in the Annual Network plans to ensure site information is correct.

OPERATIONS

Introduction

The purpose of this section is to evaluate the operation, support and siting of air monitoring instrumentation according to EPA requirements at 40 CFR 58, Appendices A, C, D and E. Network operations at the ARB are primarily performed by the Air Quality Surveillance Branch (AQSB) of MLD. AQSB duties include the operation of the ARB monitoring sites, monitoring support for the ARB special studies, and general air monitoring support, which includes repair and calibration facilities. This section of the TSA report addresses AQSB's general operations, the calibration program, field operations of the AQSB at the ARB operated criteria pollutant monitoring sites, and field operations at criteria pollutant monitoring sites operated by the San Joaquin Valley APCD, the Great Basin Unified APCD and the Northern Sierra AQMD.

EPA interviewed those managers and staff of the Air Quality Surveillance Branch (AQSB) who provide support to the field monitoring task. The individuals interviewed included Ken Stroud, Chief Air Quality Surveillance Branch, Reginald Smith, Manager Operational Support Section, Eric McDougall, Manager Special Purpose Monitoring Section, Joe Rohr, Instrument Technician Operations Support Section, and Ronald Lewis, Air Pollution Specialist Air Monitoring Central Section. All persons in the Air Quality Surveillance Branch interviewed were very helpful and forthcoming. The AQSB has a well developed framework to support the MLD monitoring task. It was particularly noted that the Operational Support Section includes functions that add significant value to AQSB's monitoring program, both in terms of technical expertise and improved monitoring data quality.

General Findings on ARB Operations

Finding AQSB1: Field operators do not always document shipping information on their sample report/tracking sheets. See also Lab Finding #IL7

Discussion: Documentation of sample shipping, transport, and relinquishment, maintains sample custody throughout the sampling process, attests that sample were handled properly, and documents by whom they were handled. This information is important if a question about a sample's validity arises.

Recommendation: Ensure that field operators are aware of the importance of documenting shipping information.

Finding AQSB2: Some ARB MLD monitoring SOPs are outdated and/or incomplete.

Discussion: ARB should develop a schedule for updating all monitoring SOPs and ensure that the SOP's posted are complete and cover all instruments used in the ARB monitoring network

Finding AQSB3: White out was noted on an MLD air monitoring form.

Discussion: It was noted that white out was used on a form produced by the MLD monitoring group. Changes to official records should not be covered or obliterated. Generally, mistakes should be indicated by a single line crossed out and with an initial and date.

Recommendation: ARB personnel should follow appropriate procedures when making corrections to official documentation and records.

Instrument Calibration Program

ARB is responsible for calibrating its own criteria pollutant monitors and offers calibration support to districts if requested. Of the approximately 341 criteria pollutant monitors in the ARB PQAO, ARB calibrates 139 instruments (96 ARB instruments and 45 District instruments). ARB also calibrates some non-criteria pollutant instruments. Of the approximately 97 non-criteria pollutant instruments and 113 meteorological instruments, ARB calibrates its own 39 non-criteria instruments and 37 meteorological stations and calibrates 11 District operated non-criteria instruments and 2 District operated meteorological stations.

Finding AQSB4: ARB MLD does not calibrate monitoring equipment at all PQAO sites.

Discussion: Over the past decade the ARB MLD monitoring sections have reduced calibration support for District sites. Consequently, Districts have established their own instrument calibration procedures independent of the ARB PQO. This practice does not support the existence of a centralized standardization of instrumentation and consequently consistent data quality throughout the PQO.

Recommendation: The corrective action for this finding is dependent on how the EPA, the ARB and the local Districts address the overall organization issues of the ARB PQAO.

Finding AQSB5: Second level review of calibration records and calculations is not routinely done.

Discussion: The senior field technicians are responsible for calibration of the ARB MLD field instruments for their respective monitoring sections (North, South, and Central). These technicians generate calibration records, which are not necessarily reviewed by a

peer or a manager. Second level review is important to ensure consistency and to catch errors made in transcriptions or calculations.

Recommendation: The ARB needs to institute a program of second level review of calibration records.

Finding AQSB6: The lowest ozone calibration point is at a concentration that is above the 8 hour standard.

Discussion: The ARB MLD Air Quality Surveillance Branch calibrates ozone monitors down to 0.09 ppm. This concentration is above the NAAQS of 0.08 ppm. In order to verify linearity around or below the NAAQS, ARB should change the low ozone calibration point to at or below 0.08 ppm.

Recommendation: The ARB calibration program needs to ensure the performance of ozone instruments at levels at or lower than the ozone NAAQS. EPA suggests this be accomplished by using a lowest calibration point at or below 0.08 ppm.

Finding AQSB7: The calibration technician noted that only 2 gas phase titration points are used to verify the NO2 calibration.

Discussion: 40 CFR Part 50, Appendix F describes the requirements for NO2 calibration. Section 1.5.9.4 states: "Maintaining the same FNO, FO, and FDas in section 1.5.9.1, adjust the ozone generator to obtain several other concentrations of NO2over the NO2range (at least five evenly spaced points across the remaining scale are suggested)." Based on the regulation "several" other NO2 point after the initial must be evaluated.

Recommendation: ARB MLD should include more evaluation points in the NO2 gas phase titration.

Finding AQSB8: Maintenance and performance verification of zero air scrubbers used for calibrations is not documented.

Discussion: Zero air scrubbers are used in place of certified zero air for instrument calibrations. This is a common practice and acceptable. Because zero air is used to generate the zero point and the calibration mixes it must be treated as a standard. As such, zero air scrubber maintenance and verification must be documented.

Recommendation: The ARB needs to begin documenting of the maintenance and performance verification of zero air scrubbers.

Special Purpose Monitoring Section

Finding AQSB9: The Special Purpose Monitoring Section should keep EPA informed of its monitoring projects.

Discussion: The Special Purpose Monitoring Section conducts monitoring as a "contractor" for the ARB or other agency (e.g., Department of Pesticide Regulation) researchers. Some of this monitoring may be funded wholly or partially by EPA (through ARB or other State Agencies) and could have implications related to NAAQS determinations, network design, or other EPA requirements and/or decision-making. Therefore, where possible and appropriate, an EPA monitoring contact should be informed of monitoring that is taking place.

FIELD OPERATIONS

During this TSA the EPA audited the operations at 14 monitoring stations as summarized in the following table.

TABLE 4. MONITORING STATIONS EVALUATED BY US EPA DURING THE 2007 ARB TSA

Operating Agency	Monitoring Station
ARB	Stockton - Hazelton
	Modesto - 14th Street
	Oildale
	Visalia
	Fresno – 1st Street
San Joaquin Valley APCD	Bakersfield – Golden State Highway
	Corcoran
	Parlier
	Tracy
	Fresno – Clovis
Northern Sierra AQMD	Grass Valley
	Portola
	Truckee
	Quincy
Great Basin Unified APCD	Coso Junction
	Dirty Socks
	Lone Pine
	Mono Shore
	Lee Vining
	Mammoth

ARB Monitoring Sites

Five monitoring stations operated by the ARB were evaluated as part of this TSA. EPA interviewed a number of ARB field technicians, including Ron Lewis, Phillip Powers, Ralph Robles, Dianne Arnold, George Jung, and Patrick Seamus. The ARB is to be commended for having an especially competent staff of field operators. During our discussions of operations, staff all exhibited an extensive knowledge of instrument operations and the day to day documentation of activities was exemplary. Senior field technicians were very engaged in all operations of their sites. EPA also appreciates the relationship the Air Monitoring Central Section has with local District operators. The invaluable technical support provided to the Districts was very evident.

All ARB monitoring sites evaluated were well equipped, organized and clean. The field technicians had access to all relevant SOPs. Stations were set up to automatically perform zero, span and precision checks of continuous gaseous instruments on a schedule that exceeds EPA requirements. The flow rate of low flow PM instruments is checked bi-weekly, calibrations of low-flow samplers is semi-annually. High volume PM sampler flow checks are performed monthly and calibrated semi-annually. Flows are checked at 16.67 lpm for low flow instruments and at 40 scfm for high volume instruments. For gaseous instruments, flow checks are done daily and calibrations are performed semi-annually.

Field technicians interviewed were well versed in their duties regarding data validation and how to address corrective actions. Corrective actions are dealt with on a case-by-case basis. If a site instrument fails an annual audit, specific corrective actions are taken based on consultation with senior field operations staff. The operators are encouraged to document any unusual events in the station log, sample data forms and strip charts. All documentation regarding data editing and validation is reviewed and signed off monthly by the senior field technician before forwarding to the Special Purpose Monitoring and Data Support Section of the Air Quality Surveillance Branch of the Monitoring and Laboratory Division. While deviations from SOPs are rare, in the event that a deviation from a SOP is necessary, it is documented in the station log after consultation with senior field technicians.

All stations maintain log books to document site visits, preventive maintenance, resolution of operational problems, and corrective actions taken. Logbooks were generally very detailed. The senior monitoring technicians periodically review the logbooks and also note in the logbook when they visit the station. A standard, routine review of logbooks is not performed. Operators archive station logbooks at their main monitoring station or office. Other station records include QC checklists and maintenance sheets which are also archived at the operator's main monitoring station or office. All necessary calibration information is available to the field operators.

The ARB has a comprehensive mandatory training program for new monitoring staff. Staff are also given the opportunity to attend refresher courses given by the ARB and instrument manufacturers.

Minor instrument repair work is done at the station. If necessary, equipment is sent to the MLD for major repairs. Replacement equipment is sent to the station within a day to replace any instruments taken out of service for repair. Other than standard manufacturer warranties, the ARB does not have any service contracts in place. Station operators indicated that they have an adequate supply of spare parts and consumable supplies to ensure that necessary repairs and maintenance can be performed.

ARB Field Operation Findings

Finding AQSB9: The trees to the east of the Fresno 1st Street station building are about 15 meters from the inlet probe and PM manual instruments.

Discussion: EPA siting criteria require that trees are at least 10 meters from instrument inlets and at least 20 meters when the trees act as an obstruction. CARB plan to relocate this station to its proposed new site 375 meters to the east southeast will address this finding.

Recommendation: None.

Finding AQSB10: At the Stockton-Hazelton monitoring station, a large tree to the south of the trailer is acting as an obstruction for the gaseous pollutant sample train inlet as well as to the PM10 and PM2.5 samplers. This site does not meet the probe siting criteria in 40 CFR 58, Appendix E.

Discussion: The obstruction caused by this tree has been noted in previous visits to the site. According to Ron Lewis, Lead Air Pollution Specialist, the tree has been trimmed in the past in an attempt to minimize its affect as an obstruction. The PM manual samplers were previously located on the roof of the Health Department Building but were moved to the top of the station trailer when the Health Department roof was repaired. Ron believed they could return the PM samplers to the roof. If so, the PM samplers would meet all siting criteria.

The inlet for the gaseous instruments will need to be moved or the tree trimmed significantly in order to meet siting criteria.

Recommendation: Address siting issues by relocating PM samplers to the roof of the Health Department Building. Develop a plan to address the siting of the gaseous instrument inlet probe by either moving inlet probe (this may not be an option since probe already appears to be as far away from tree as possible), moving the trailer farther from the tree, or by significantly trimming the tree so that it no longer obstructs air flow.

Finding AQSB11: The palm tree northwest of the Visalia monitoring station is within 10 meters of the inlet probe.

Discussion: As stated in 40 CFR 58, Appendix E (Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring), sections 2.4 and 8.2, trees can provide surfaces for ozone or NO_2 adsorptions or reductions, surfaces for particulate deposition, and generally obstruct wind flow. EPA understands that removing a tree, especially from a leased site, is not always possible. ARB should perform an analysis of the prevailing wind direction at the Visalia site to determine the direction of the prevailing winds. If the prevailing winds are generally from the northwest, ARB will need to correct this siting issue, either by having the tree trimmed or removed or relocating the site.

Recommendation: Perform an analysis of prevailing wind directions at the Visalia site to help evaluate the impact of the palm tree northwest of the inlet probe and manual samplers.

San Joaquin Valley APCD Monitoring Sites

Five monitoring stations operated by the SJVAPCD were evaluated as part of this TSA. Three operators were interviewed, Warren Leleaux, Duane Thompson, Jaime Contreas, and Carl Camp. Other SJVAPCD interviewed were Steve Shaw and Kashmir Pandher. The San Joaquin Valley District field technicians are well versed in equipment operations but there are variations in how they perform certain procedures, such as general station documentation and manifold cleaning and conditioning. However, quality control checks and maintenance of equipment are performed in accordance with EPA requirements and guidance. Field technicians are responsible for day-to-day operations as well as instrument repair and maintenance at their assigned stations.

There are no field SOPs available to site operators. Operators rely on instrument operation manuals and ARB SOPs, when available. SJVAPCD operators acknowledged the need for specific instrument and operation SOPs but stated that lack of District monitoring resources made it difficult to address all of the areas in the monitoring program that needed attention.

Stations were set up to automatically perform zero, span and precision checks of continuous gaseous instruments on a schedule that exceeds EPA requirements. The flow rate of low flow PM instruments is checked bi-weekly, calibrations of low-flow samplers is semi-annually. High volume PM sampler flow checks are performed monthly and calibrated semi-annually. Flows are checked at 16.67 lpm for low flow instruments and at 40 scfm for high volume instruments. For gaseous instruments, flow checks are performed each time the field technician visits the site and calibrations are performed semi-annually.

All stations maintain log books to document site visits, preventive maintenance, resolution of operational problems, and corrective actions taken. Logbooks were generally detailed. Operators archive station logbooks at their main monitoring station or office. Other station records include QC checklists and maintenance sheets which are

also archived at the operator's main monitoring station or office. All necessary calibration information is available to the field operators.

Corrective actions are dealt with on a case-by-case basis. If a site instrument fails an ARB annual audit, specific corrective actions are taken based on consultation with ARB field operations staff. The SJVAPCD does not have any specific SOPs that address instrument corrective actions. Station operator can note special circumstances on strip chart.

SJVAPCD Field Operation Findings

Finding SJV1: The San Joaquin Valley APCD does not have District specific SOPs addressing the operation and maintenance of its air pollution monitoring network.

Discussion: The district staff relies on the CARB SOPs for instrument operations. While this is acceptable in practice, the district should ensure that copies of the SOPs are readily available to all station operators. There is no process in place to ensure this will occur.

From a strictly performance perspective, the station operators have a clear knowledge of the monitoring instruments and all required and appropriate QC checks are performed and documented. Yet there are some variations in the QC checks, e.g. concentrations used in span checks for gaseous instruments as well as maintenance procedures, e.g. manifold cleaning procedures.

SOPs detail the work procedures that are to be conducted or followed within an organization. SOPs document the way activities are to be performed to ensure consistent conformance to technical and quality system requirements and to support data quality. SOPs are intended to be specific to the organization or facility whose activities are described and assist that organization to maintain their quality control and quality assurance processes and ensure compliance with governmental regulations. Well-written SOPs can also serve as training materials and as references for operators, particularly if they are updated regularly (i.e., recommended every three years). SOPs should be distributed in a manner that ensures that only the most recent versions are used (controlled-copies). Further guidance on developing SOPs can be found in the EPA guidance document "Guidance for Preparing Standard Operating Procedures", EPA/240/B-01/004, March 2001. Deviations and changes from SOPs should be dated, documented, and kept in a bound or electronic document routinely accessed by and accessible to all staff.

Recommendation: The SJVAPCD needs to develop District specific SOPs (with ARB approval) for all pollutant and meteorological monitoring instruments. Alternatively, the SJVAPCD can adopt the ARB SOPs.

Finding SJV2: The SJVAPCD field operators do not maintain zero and span or precision check control charts.

Discussion: The data logging software used by the District at its monitoring stations can chart QC check data if technician wishes to examine a graphical presentation of QC data, however, there is not a standard practice of printing control charts on any set schedule. This is in contrast to the ARB operations, where the station operators print out and review control charts on a monthly basis as part of the first level data review.

Recommendation: As part of the overarching finding on SOPs discussed above, the San Joaquin Valley APCD should develop first level data review SOPs for use by the field technicians. This SOP should require the use of control charts as part of the data review and verification process.

Finding SJV3: Station and instrument logbooks are not reviewed by the Supervising Air Quality Instrument Technician.

Discussion: There are log books maintained at all stations to document site visits, preventive maintenance, resolution of operational problems and corrective actions taken. The logbooks were all complete, detailed and up-to-date. However, no supervisors review the station logbooks. The SJVAPCD Supervising Air Quality Instrument Technician acknowledged the need for reviewing the logbooks periodically but stated that given the limited number of personnel, the time available to him to perform such supervisory tasks was limited.

Recommendation: In order to ensure that field personnel are performing activities consistent with the District SOPs (see SOP discussion above) there needs to be some level of oversight of field staff. This oversight task can either be performed by the Supervising Air Quality Instrument Technician or by a first line supervisor.

Finding SJV4: There is no current, consistent procedure in place for archiving all station records.

Discussion: Field technicians will generally archived used logbooks at their offices. Instrument maintenance and check sheets which are the record of QC checks are archived at the District office or at ARB. While a decentralized system of archiving station is acceptable, there should be written procedures in place so that field technicians use consistent procedures. Ideally there should be a central, secure facility for all ambient monitoring documentation. Station documentation sent to the ARB should be copied and retained by the District.

Recommendation: The San Joaquin Valley APCD should develop a SOP for document and record archiving.

Finding SJV5: At the Bakersfield – Golden State Highway site, the area surrounding the trailer which houses the monitoring equipment needs to be stabilized.

Discussion: Bakersfield Golden State Highway is one of the higher reading PM10 sites in the San Joaquin Valley District network. EPA regulations at 40 CFR 58, Appendix E, section 8.4 states "Stations should not be located in an unpaved area unless there is vegetative ground cover year round, so that the impact of wind blown dust will be kept to a minimum".

Recommendation: Stabilize the parking area where the Bakersfield Golden State Highway trailer is located.

Northern Sierra AQMD Monitoring Sites

The Northern Sierra Air Quality Management District (NSAQMD) operates a network of ozone and PM monitoring instruments. Four monitoring stations run by the NSAQMD were evaluated. Three field technicians were interviewed: Joe Fish, the air monitoring manager, George Ozanich, and Ken Walker. The NSAQMD field technicians all exhibited a thorough knowledge of equipment operations. All quality control checks and maintenance are performed in accordance with EPA regulations. Field technicians are responsible for day-to-day operations as well as instrument repair and maintenance at their assigned stations. The monitoring manager performs calibrations of the ozone instruments.

The monitoring stations operated by the NSAQMD are not set up to perform automated QC checks. All zero, span, and precision checks for ozone are performed manually about once a week and flow checks of PM instruments are performed once per month, which exceeds EPA requirements.

Northern Sierra AQMD uses the ARB SOPs. Hardcopies of the SOPs are kept at the Grass Valley office/site but not at any other sites. Site operators have the instrument manuals but not the SOPs. Operators keep track of special events or anomalies for continuous instruments in a monthly report sheet and also document issues for the monitoring manager. Any special events or anomalies for FRM PM2.5 are recorded on the Chain of Custody sheet and sent to CARB with the filter. Standard logbooks are not used by NSAQMD, but alternative documentation methods are utilized, e.g. electronic files and binders. Station operators may keep their own records, though the records kept are at their own discretion.

NSAQMD Field Operation Findings

Finding NS1: The NSAQMD field technicians have instrument manuals but not SOPs. The ARB SOPs are only kept at the District's main office in Grass Valley and are not at field stations. Additionally, the District operations deviate from the ARB SOPs but do not document those deviations.

Discussion: SOPs detail the work procedures that are to be conducted or followed within an organization. SOPs document the way activities are to be performed to ensure consistent conformance to technical and quality system requirements and to support data quality. SOPs are intended to be specific to the organization or facility whose activities are described and assist that organization to maintain their quality control and quality assurance processes and ensure compliance with governmental regulations. Well-written SOPs can also serve as training materials and as references for operators, particularly if they are updated regularly (i.e., recommended every three years). SOPs should be distributed in a manner that ensures that only the most recent versions are used and retains historical SOP revisions (these are sometimes called “controlled-copies”). Further guidance on developing SOPs can be found in the EPA guidance document "Guidance for Preparing Standard Operating Procedures", EPA/240/B-01/004, March 2001. Deviations and changes from SOPs should be dated, documented, and kept in a bound or electronic document routinely accessed by and accessible to all staff.

The NSAQMD has modified some of the practices in the ARB SOPs but these deviations are not documented. For example, the NSAQMD uses 5% as an action level for zero/span checks for ozone. CARB uses 10% as an action level. While it is commendable that the District uses such stringent acceptance criteria, since they are part of the ARB PQAO they should request approval from ARB to use this tighter criteria.

Recommendation: The NSAQMD needs to develop District specific SOPs (with ARB approval) for all monitoring instruments. Alternatively, the NSAQMD can adopt the ARB SOPs.

Finding NS2: The NSAQMD record-keeping procedures need to be more rigorous.

Discussion: The NSAQMD has no record keeping standard operating procedures. Pollutant instrument information is kept in an electronic format and periodically printed as hardcopies and stored in a binder. Record keeping by individual operators is not consistent and seems to be at the operator’s discretion. No station logbooks are maintained. No records for manual PM sampling are maintained.

Recommendation: The NSAQMD should develop a SOP for record keeping that includes procedures for utilizing station logbooks, maintaining other necessary records of instrument operations (e.g. QC and maintenance check sheets), provides for regular management review of records, and suitable archiving procedures to ensure the security of these records.

Finding NS3: The NSAQMD experiences significant ozone data loss due to a lack of spare parts.

Discussion: The NSAQMD experiences significant data gaps because their ozone pumps fail and they don’t have spare pumps. They either have to rebuild them or order a new one.40 CFR 50.11 requires hourly data that are at least 75% complete. To ensure that

this requirement is met, prolonged instrument down-time should be avoided, if at all possible.

Recommendation: NSAQMD should have at least one spare ozone pump to avoid unnecessary loss of data.

Finding NS4: ARB performed audits of the NSAQMD PM instruments do not conform to CFR requirements. Additionally, the NSAQMD stated that the ARB does not perform through the probe audits of NSAQMD ozone monitors.

Discussion: Flow audits for PM instruments should occur every 6 months but the schedule has been closer to once/year. For example, the two most recent PM flow audits performed by the ARB were listed by the NSAQMD monitoring manager as occurring on 8/8/2006 and 6/4/2007.

While the ARB performs ozone audits at the required frequency, the NSAQMD monitoring manager noted that during the last two audits, on 6/26/2006 and 6/4/2007, the ARB staff did not perform through-the-probe audits. The NSAQMD monitoring manager stated that the audit gas was introduced directly into the ozone instruments and not through the sampling train. There was no explanation for this revised procedure.

Recommendation: CARB flow checks for PM samplers should be scheduled for every 6 months for PM instruments. Regarding the ozone audits, the ARB needs to ensure that consistent procedures are followed by the audit team. If there is a specific reason why a through-the-probe audit is not possible, this should be communicated to the NSAQMD monitoring manager and documented in the audit report.

Finding NS5: There is no feedback from the ARB on outcome of PM filters. See also Laboratory Finding # IL8

Discussion: The chain of custody sheets and PM filters are sent from local Districts to the ARB, where all subsequent sample handling and data reporting occurs. The ARB does not report back to Districts for many months so there is no opportunity for make-up sampling runs or to address problems in a timely manner. In the case of exceedance values and PM10 samplers running on a one in six day schedule, Districts need to promptly know when an exceedance of the 24 hour NAAQS occurs so that they have the option of increasing the PM10 sampling frequency to avoid having a single exceedance represent a violation of the NAAQS.

Recommendation: Immediately report filter results when they indicate a problem or an exceedance.

Finding NS6: The most recent ARB site survey report was not accurate.

Discussion: The EPA auditor noted a number of inaccuracies on the ARB audit sheet for Grass Valley, including:

- A tree within 4 m of ozone inlet
- Ozone calibration listed as not current but then was not listed as an action item.
- BAM – the audit report doesn't specify whether the BAM is PM10 or PM2.5. The BAM at Grass Valley is measuring PM2.5 but the purpose listed in the audit sheet is SLAMS. The BAM is not a FEM approved method for PM2.5.
- The logbook at Portola was listed as up to date. I was told there is no logbook.

Recommendation: CARB should review siting criteria and information on site survey report during audits.

Finding NS7: The NSAQMD does not utilize strip chart backup for its ozone instruments.

Discussion: EPA strongly recommends the use of some form of strip chart backup for all continuous instruments. These can be either hard copy strip charts or electronic strip charts. A strip chart record can be an invaluable tool in reviewing data as well as providing an alternative source of data in the event of data logger failure or phone outage.

Recommendation: Provide a strip chart back up data recorder for all continuous instruments.

Finding NS8: There are trees within 20 m of monitors.

Discussion: Siting requirements state that trees should be >20 m from ozone inlet, otherwise they act as obstructions (40 CFR 58, appendix E). At the Grass Valley site, there is a tree within 4 m of the ozone inlet. At the Quincy site there is a group of trees 10-12 m from ozone, PM2.5, and PM10 instruments.

Recommendation: The NSAQMD needs to address this siting issue by either trimming or removing the trees or relocating the inlets of the instruments.

Great Basin Unified APCD Monitoring Sites

The Great Basin Unified Air Pollution Control District (GBUAPCD) is the responsible local agency for ambient monitoring in Inyo, Mono and Alpine Counties in California. As stated in the District's QAPP for PM10, "…it is the GBUAPCD's responsibility to develop long-range comprehensive programs to achieve and maintain Federal and state air quality standards. The GBUAPCD is responsible for the implementation of the air quality monitoring program and the enforcement of Federal, State and local rules and regulations governing air quality at the local level".

The Air Quality Monitoring Section conducts all air quality and meteorological monitoring and laboratory activities for the District. The Air Monitoring Specialist, Christopher Lanane, supervises day-to-day operation of the network and the laboratory, including field operations, maintenance and calibrations, field QC, data collection and

validation and is responsible for writing the QAPPS. The QA (including performance audits, level 2 data validation and AQS upload) personnel are supervised by the Deputy Air Pollution Control Officer, Duane Ono. The members of GBUAPCD staff interviewed by EPA for this audit include:

Christopher Lanane, Air Monitoring Specialist
Dan Johnson, Air Quality Technician II
Guy Davis, Air Quality Technician II
Gabe Ibarra, Air Quality Technician II
Jim Parker, Senior Research Analyst
Phil Kiddoo, Research and Systems Analyst II
Mike Horn, Air Quality Technician II

All staff interviewed showed a thorough understanding of the monitoring program and required QC and QA practices and their importance in determining the quality of GBUAPCD's monitoring data.

Station operators conduct day-to-day operations as well as instrument repair and maintenance at their assigned stations. Their duties include extensive and well-documented biweekly, monthly and periodic quality control checks for all instruments and data validation through level 1 at each station. The operators interviewed were familiar with the District QAPPs although copies were not in place at all sites. In part, this is due to the lack of secure storage space at some monitoring stations.

The majority of GBUAPCD's network (8 of 14 SLAMS sites) consists of both filter-based FRM and continuous PM10 monitors for surveillance of known sources: Owens and Mono lakebeds and a geothermal power generator. The District currently does not operate any gaseous criteria pollutant monitors. Under EPA;s monitoring regulations, the District has no areas requiring gaseous criteria pollutant monitoring based on the low population of its towns and villages. However, discussion with the District was begun regarding the possibililty of establishing a rural NCore station in the air basin.

The monitoring stations visited included Coso Junction, Dirty Socks, Lone Pine, Mono Shore, Lee Vining and Mammoth. The monitoring objectives at each site vary from population-oriented surveillance (Lone Pine, Lee Vining, Mammoth) to source-oriented monitoring (Coso Junction, Keeler, Mono Shore. Station logbooks and instrument logbooks were mostly up to date and contained relevant information on operations, repair and maintenance activities. All sites met the siting criteria of 40 CFR 58, Appendix E, where applicable (population-oriented sites).

GBUAPCD operates an independent QA program for all its PM and meteorological monitoring and laboratory activities. Although there is not a defined manager for QA activities, well-defined and documented QA procedures were clearly described by the personnel interviewed. The District's QA project plans for PM2.5 and PM10 are very thorough and include district-specific standard operating procedures. The QA program includes biweekly flow checks by the station operators, quarterly

independent flow audits of the instruments, chain-of-custody procedures for collected filters, a system of QC procedures which are documented for each site, extensive QA/QC for the gravimetric laboratory for both PM10 and PM2.5 filter weighings, monthly data review station-by-station to verify completeness and validity, detailed corrective action procedures, annual calibration of all flow standards (transfer standards and NIST-traceable primary). During the audit, EPA received a copy of GBUAPCD's most recent PM10 QAPP which will be reviewed for approval by Region 9. In 2002, as part of the PM10 QA program, the District employed an outside consultant to conduct an independent System Audit of the PM10 monitoring program which found no compliance issues. Another example of an independent QA program element is the monthly meeting of the District's technical staff which allows for interaction on problem-solving and standardizing of procedures among operators.

GBUAPCD manages all of the ambient monitoring data generated by the district. Data quality objectives and measurement quality objectives have been defined for the GBUAPCD's program. Station operators ensure data collection and sample handling occur according to specific SOPs and validate data from their stations. The QA staff (non-operators) verify and validate data through level two validation, as defined in the QAPPs. Based on a memorandum of understanding with the District, ARB and EPA, GBUAPCD submits their own data to AQS. Data is archived at either the main office in Bishop or the field office in Keeler.

GBUAPCD maintains a laboratory for weighing PM2.5 and PM10 filters. The laboratory meets or exceeds the gravimetric and temperature and humidity QC requirements for PM2.5 (40CFR Part 50 Appendix L) and therefore, meets and exceeds the requirements for PM10 filter weighings. They employ a rigorous monthly verification procedure for microbalance standards, temperature and humidity measurement checks.

GBUAPCD has provided technical and QA support to tribal monitoring programs within the Great Basin. EPA commends the District for their willingness to extend their monitoring expertise to the development of community monitoring programs by tribal agencies.

GBUAPCD Field Operation Findings

Finding GB1: Great Basin operates an independent monitoring, laboratory and QA program from that of ARB.

Discussion: GBUAPCD has independent QAPP's for its PM2.5 and PM10 monitoring programs and laboratory operations. The QAPPs incorporate SOP's written by the District. QA oversight by ARB consists of a flow audit once per year.

Recommendation: GBUAPCD should be considered an independent QA organization, separate and distinct from the ARB, for purposes of annual data summary statistical evaluation and comparison to the NAAQS.

Finding GB2: GBUAPCD's Training program (a QA function) is independent and separate from that of ARB.

Discussion: GBUAPCD has independent training and education requirements as part of its General and Ambient Monitoring-specific training.

Recommendation: See Finding GB1.

Finding GB3: Logbooks were not all up to date and signed by the GBUAPCD operators at all stations.

Discussion: Logbooks are an important legal record for defending the monitoring data collected by an agency. They show the activity by the operator at the site.

Recommendation: Logbooks should be signed and entries should reflect on-site activities which may effect data validation and/or completeness.

LABORATORY OPERATIONS

Introduction

Analytical laboratories provide support for measurement methods that are either too complex or sensitive to perform in the field environment. In order to provide these services, laboratories employ complex instrumentation and staff with highly specialized training.

For ambient air samples to provide useful information or evidence, laboratory analyses must meet the following four basic requirements:

1. Equipment must be frequently and properly calibrated and maintained.
2. Personnel must be qualified to make the analysis.
3. Analytical procedures must be in accordance with accepted practice.
4. Complete and accurate records must be kept.

The ARB MLD Northern Laboratory Branch (NLB) is divided into three sections the Inorganic Laboratory Section, Organic Laboratory Section, and the Special Analysis Section. The laboratory facility is adequate for the NLB's needs. The laboratory provides analytical support for the criteria pollutants PM10, and PM2.5. Additionally, the laboratory supports the EPA PM Speciation Trends Network (STN), the California Air Toxics Monitoring Network, and Special Study Monitoring. The laboratory audit focused on PM10, PM2.5, and methods that had not been previously audited as part of the Speciation Trends Network. Many of the non-criteria pollutant methods are performed primarily for State purposes with minimal support from EPA. The NLB Chief and all the staff interviewed were extremely cooperative, knowledgeable, and interacted professionally with the auditors.

Overall, EPA was impressed with the organization and the attention to detail the laboratory exhibited. While EPA has included several areas for potential improvement no serious deficiencies were noted.

This section is divided into two sections, one that addresses findings for the Inorganic Laboratory operations and one that addresses findings for the Organic Laboratory operations.

Inorganic Laboratory

Finding IL1: The MLD weigh sessions have been automated in a manner that reduces the possibility of operator error.

Discussion: EPA Region 9 was impressed with the automated weighing process and was pleased to note that the technicians were engaged in the development of this system.

Finding IL2: Mass determination of PM10 filters should include blank controls.

Discussion: Blank controls help to evaluate the impacts of filter handling and storage in the laboratory and the field. They are required in regulation as a mechanism for evaluating filter media, see 40 CFR Part 50, Appendix J, Section 7.2.3. Additionally, EPA Compendium Method IO-3.1 notes in Section 5.4, "Provide one blank sample with ever 10 actual samples."

Recommendation: The MLD should include routine blank controls as a part of the PM10 laboratory operations.

Finding IL3: Temperature and humidity measurements in the weigh rooms are only logged on a paper chart and are not formally analyzed to determine compliance with regulatory criteria.

Discussion: Usual the temperature and humidity in MLD's two weigh rooms is stable. However there are times when temperature and humidity spikes and/or excursions occur. Currently the technicians "eyeball" the charts to determine compliance with regulatory requirements. If MLD was to calculate the actual conditions with the aid of a software program and electronic data logging software, there would be no question as to when weigh room conditions were suitable.

Recommendation: MLD should look into upgrading the system for monitoring compliance with temperature and humidity requirement in the weigh rooms.

Finding IL4: The PM10 laboratory only recently started a logbook to track verification of "working" mass standards.

Discussion: The PM10 "working" mass standards are used with every batch of filters to verify balance performance. Their weight is periodically verified by a comparison check to "primary" mass standards. For the data tracked from 2006 no documentation of this verification was available. However, there was a logbook recently begun to rectify this deficiency. It is recommended that this logbook be continued and that it contain additional documentation (such as mass standard identifiers), similar to what is provide for the PM2.5 "working" standard verification logbook.

Recommendation: The PM10 standard verification logbook should include information similar to that available in the PM2.5 standard verification logbook.

Finding IL5: Several additional improvements could be made to the PM2.5 weighing process.

Discussion: The following were noted:

The PM2.5 filter identification numbers (embossed on each filter) are not recorded. Using the numbers on the filters is a mechanism to prevent and identify the mixing up of filters. Because the MLD PM2.5 weigh room procedure is extremely organized the auditor did not find this to be a significant concern.

The start date and time for the beginning of pre-weight conditioning of PM2.5 filters was not documented. Because filters are conditioned well in excess of 24 hours and the PM2.5 laboratory is well organized this was not considered significant.

The laboratory staff was not aware of new regulatory requirement for PM2.5 monitoring. Of particular not is the new temperature requirement from 40 CFR Part 50, Appendix L, included below:

> 8.3.6 The post-sampling conditioning and weighing shall be completed within 240 hours (10 days) after the end of the sample period, unless the filter sample is maintained at temperatures below the average ambient temperature during sampling (or 4 °C or below for average sampling temperatures less than 4 °C) during the time between retrieval from the sampler and the start of the conditioning, in which case the period shall not exceed 30 days. Reference 2 in section 13.0 of this appendix has additional guidance on transport of cooled filters.

Recommendation: The MLD laboratory should take these three observations into consideration as possible improvements to the PM2.5 mass analysis process.

Finding IL6: The PM10 and PM2.5 documentation and archived filters were well organized and easily tracked.

Discussion: EPA Region 9 performs a data tracking exercise as part of our technical system audits to simulate what might happen if our designation decisions are in question and/or challenged and data documentation needs to be verified. The MDL laboratory staff did an excellent job locating the data request by the auditor.

Finding IL7: Field operators do not always document shipping information on their sample report/tracking sheets. See also Operations Finding #AQSB1.

Discussion: Documentation of sample shipping, transport, and relinquishment, maintains sample custody throughout the sampling process, attests that sample were handled properly, and documents by whom they were handled. This information is important if a question about a sample's validity arises.

Recommendation: Ensure that field operators are aware of the importance of documenting shipping information.

Finding IL8: A local District stated that there was lack of sufficient feedback from the ARB on outcome of PM filters. See also Operations Finding #NS8.

Discussion: The chain of custody sheets and PM filters are sent from local Disricts to the ARB, where all subsequent sample handling and data reporting occurs. The ARB does not report back to Districts for many months so there is no opportunity for make-up sampling runs or to address problems in a timely manner. In the case of exceedance values and PM10 samplers running on a one in six day schedule, Districts need to promptly know when an exceedance of the 24 hour NAAQS occurs so that they have the option of increasing the PM10 sampling frequency to avoid having a single exceedance represent a violation of the NAAQS.

Recommendation: Immediately report filter results when they indicate a problem or an exceedance.

Organic Laboratory

We reviewed and evaluated five procedures performed by the Organic Laboratory Section:

1) SOP MLD 022, Aldeydes and Methyl Ethyl Ketone (MEK) by High Performance Liquid Chromatography (HPLC),
2) SOP MLD 039, Hexavalent Chromium by Ion Chromatography (IC),
3) SOP MLD 058, Aromatic and Halogenated Hydrocarbons by Gas Chromatography/Mass Spectrometry (GC/MS),
4) SOP MLD 066, Oxygenated Hydrocarbons and Nitriles, and
5) Canister Cleaning & Certification.

In general we believe that the Organic Laboratory Section is well run. The most significant findings address the issues of analyzing audit samples, evaluation of a new GC/MS, and carbonyl field blanks. The remaining findings are recommended practices that we believe would improve the defensibility of data produced by the laboratory.

Aldeydes and Methyl Ethyl Ketone (MEK) by High Performance Liquid Chromatography (HPLC)

Finding OL1: A second source quality control standard is not being analyzed as required by the method. Analysis of a second standard is being performed but the standard is not prepared from a second stand source and is prepared as a dilution of the same standard solution that is used to prepare the working calibration standards.

Discussion: Analysis of a second source quality control standard referenced to the initial calibration is an effective quality assurance control check on the integrity of the primary standard solution and is required by the method.

Recommendation: It is recommended that the analysis of the control standard be prepared from a second standard source.

Finding OL2: Audit samples are not being analyzed.

Discussion: Audit samples prepared from a different standard source than instrument calibration standards are an important independent quality assurance technique used to assess the accuracy of the data generation process. Audit samples can help to surface out of control situations with the instrument or standards or other problems that may not be apparent from routine instrumental generated quality control (QC) results such as calibrations or data inspection. Documentation of acceptable results for routine audit samples would serve an important role in increasing the level of confidence in data.

Recommendation: It is recommended that a program of routine submission of audit samples be implemented. Ideally the audit samples should be submitted to analysts double blind i.e. without their knowledge they are analyzing quality assurance audit samples to eliminate possible bias. Results for audit samples are best when control charted. The EPA Region 9 office may be able to assist ARB in securing funding for an audit program.

Finding OL3: Field blanks are not being analyzed. Sample results are being corrected for background contamination based on an average background contamination of 0.3 :g/cartridge determined from a field blank study performed by MLD 15 years ago. It is the understanding of the audit team that field blanks have not been deployed for 15 years.

Discussion: Routine submission of field blanks is necessary to evaluate possible contribution of contamination from sources extraneous to samples. The importance of current field blank studies is heightened in light of changes observed in field sampling technology since the background study was performed. It is questionable that the background level of contamination has remained constant.

Recommendation: A routine system of employing field blanks is recommended.

Finding OL4: The laboratory is not using an internal standard method of analysis as described by the method. The laboratory is currently using the external standard method of standardization.

Discussion: Internal standards are useful in compensating for changes in the electrical system during sample analysis and detection and perhaps more importantly compensate for changes in autosampling volume which can vary with air bubbles that impacts quantitation. Internal standard methods are more accurate than external standard methods.

Recommendation: It is recommended that the laboratory change to the internal standard method or evaluate the accuracy of its data generation process through audit samples with

rigorous control ranges and consider changing to the internal standard methods based on the results.

Finding OL5: Secondary review of instrument logbooks is not being documented.

Discussion: Regular review of instrument logbooks by a supervisor or QA department helps to ensure that proper analysis protocol is being followed, e.g. calibrations, blanks analyses etc. Repeated failures or attempts to pass calibrations noted in logbooks can be an indication that instrument maintenance or other corrective actions need to be performed.

Recommendation: It is recommended that a system of periodic review and documentation of review of instrument runlog books be implemented and documented by initialing the instrument run logbook.

Hexavalent Chromium by Ion Chromatography (IC)

Finding OL6: Audit samples are not being analyzed. The audit team was told that the ARB QA Department suggested the department initiate its own system of audit sample analysis.

Discussion: Audit samples prepared from a different standard source than instrument calibration are an important independent quality assurance technique used to assess the accuracy of the data generation process. Audit samples can help to surface out of control situations with the instrument or standards or other problems that may not be apparent from routine instrumental generated quality control (QC) results such as calibrations or data inspection. Documentation of acceptable results for routine audit samples would serve an important role in increasing the level of confidence in data.

Recommendation: It is recommended that a system of routine submission of audit samples be implemented. Audit samples should be submitted to analysts from an independent source such as the QA Department double blind i.e. without their knowledge they are analyzing quality assurance audit samples to eliminate possible bias. Results for audit samples are best when control charted.

Finding OL7: Secondary review of instrument logbooks is not being documented.

Discussion: Regular review of instrument logbooks by a supervisor or QA department helps to ensure that proper analysis protocol is being followed, e.g. calibrations, blanks analyses etc. Repeated failures or attempts to pass calibrations noted in logbooks can be an indication that instrument maintenance or other corrective actions need to be performed.

Recommendation: It is recommended that a system of periodic review and documentation of review of instrument run log books be implemented.

Finding OL8: It is noted that the laboratory is looking into the purchase of an additional IC.

Discussion: The laboratory currently has one IC dedicated to hexavalent chromium analysis which it takes great care to keep in working order in light of the fast sample degradation of hexavalent chromium samples once they have been extracted. The purchase of a second system which can serve as a back up system in case of instrument failure will help prevent the possible loss of samples through degradation.

Recommendation: The future purchase of back up testing equipment that is in the planning stages is noted as a positive finding.

Finding OL9: Secondary review of instrument logbooks is not being documented.

Discussion: Regular review of instrument logbooks by a supervisor or QA department helps to ensure that proper analysis protocol is being followed, e.g. calibrations, blanks analyses etc. Repeated failures or attempts to pass calibrations noted in logbooks can be an indication that instrument maintenance or other corrective actions need to be performed.

Recommendation: It is recommended that a system of periodic review and documentation of review of instrument runlog books be implemented.

Aromatic and Halogenated Hydrocarbons by Gas Chromatography/Mass Spectrometry (GC/MS)

Finding OL10: Duplicate samples are being analyzed and presented as tabulated results in quarterly QA reports but control charting is only occasionally performed.

Discussion: Control charting of duplicate sample results imparts added value when evaluating trends as discussed and agreed to with management.

Recommendation: The laboratory may want to plot duplicate results for added value in viewing the results and looking for trends.

Finding OL11: The GC/MS is not vented to outside the facility.

Discussion: It is normal good laboratory practice to vent GC/MS instrumentation to outside the facility as a health precaution to employees.

Recommendation: It is recommended that instrumentation be vented to outside the facility or to traps to lessen the possible inhalation of contaminated air by employees.

Finding OL12: Secondary review of instrument logbooks is not being documented.

Discussion: Regular review of instrument logbooks by a supervisor or QA department helps to ensure that proper analysis protocol is being followed, e.g. calibrations, blanks analyses etc. Repeated failures or attempts to pass calibrations noted in logbooks can be an indication that instrument maintenance or other corrective actions need to be performed.

Recommendation: It is recommended that a system of periodic review and documentation of review of instrument runlog books be implemented.

Oxygenated Hydrocarbons and Nitriles

Finding OL13: Audit samples are not currently being analyzed.

Discussion: Audit samples prepared from a different standard source than instrument calibration are an important independent quality assurance technique used to assess the accuracy of the data generation process. Audit samples can help to surface out of control situations with the instrument or standards or other problems that may not be apparent from routine instrumental generated quality control (QC) results such as calibrations or data inspection. Documentation of acceptable results for routine audit samples would serve an important role in increasing the level of confidence in data.

Recommendation: It is recommended that a system of routine submission of audit samples be implemented. Ideally the audit samples should be submitted to analysts double blind i.e. without their knowledge they are analyzing quality assurance audit samples to eliminate possible bias. Results for audit samples are best when control charted. The EPA Region is looking into possible funding for an audit sample program.

Finding OL14: GC/MS Saturn D is a new instrument which was brought on-line in April, 2007 that is being used to generated data but an MDL study has not been performed and documented.

Discussion: Documentation of instrument specific MDL studies is fundamental whenever data with non detects is being reported.

Recommendation: Data should not be reported on instrument Saturn D until an MDL study has been performed and documented.

Finding OL15: Although the MLD 066 method is based on the TO-15 method which describes and internal standard method of calibration, the laboratory is using an external method of standardization and internal standards are not being used.

Discussion: Internal standards are useful in compensating for changes in the testing equipment electrical system during sample analysis and detection and perhaps more importantly compensate for changes in autosampling volume which can have significant impacts on quantitation. Internal standard methods are generally more accurate than external standard methods.

Recommendation: It is recommended that the laboratory assess the accuracy of data generation with this method through the use of audit samples with rigorously derived quality control limits. A decision to develop an internal standard method can be based on the results. It is the understanding of the audit team from discussion with management during the onsite visit that development of an internal standard method was initially attempted during method development by ARB but abandoned due to difficulty in identifying suitable internal standards. The EPA Region is interested in offering possible assistance with the procurement of audit samples and identification of suitable internal standards.

Finding OL16: Secondary review of instrument logbooks is not being documented.

Discussion: Regular review of instrument logbooks by a supervisor or QA department helps to ensure that proper analysis protocol is being followed, e.g. calibrations, blanks analyses etc. Repeated failures or attempts to pass calibrations noted in logbooks can be an indication that instrument maintenance or other corrective actions need to be performed.

Recommendation: It is recommended that a system of periodic review and documentation of review of instrument runlog books be implemented.

Finding OL17: Mass calibration is being achieved with perfluorotributylamine (FC -43) but confirmation of that tuning abundance criteria have been met is not being verified through the analysis of 1-bromo-4fluorobenzene (BFB). It is the understanding of the audit team that tentatively identified compounds are not routinely being reported with this method.

Discussion: BFB instrument tuning checks serve to ensure correct mass peak assignment (rule out possible mass shifts) and ion abundance ratios. Verifying that tuning and performance criteria are met prior to sample analysis with BFB ensures that data produced by the instrument may be correctly interpreted and allows non target list compounds to be tentatively identified through library search routines. In our experience, the BFB tune also serves a secondary purpose of monitoring instrument sensitivity because failure of the tuning check is often the first indicator of sensitivity loss.

Recommendation: The FC-43 method of tuning should be acceptable as long as tentatively identified compounds (TICs) are not reported. It is recommended the SOP be revised to reflect that a BFB tune will be performed for special events where TICs are reported.

Finding OL18: The GC/MS is not vented to outside the facility.

Discussion: It is good laboratory practice to vent GC/MS instrumentation to outside the facility as a health precaution to employees.

Recommendation: It is recommended that instrumentation be vented to outside the facility or to traps to lessen the possible inhalation of contaminated air by employees.

Canister Cleaning & Certification

Finding OL19: Laboratory staff stated a random pull of canisters for certification testing is performed. The laboratory does not take into consideration which canisters had the highest concentrations of contaminants prior to cleaning when deciding which canister in each batch to test for cleanliness certification.

Discussion: Random pulls of canisters for certification could be expected to result over time in an eventual pull of all canisters including those most heavily contaminated prior to cleaning. However, some sources such as the "Technical Assistance Document for Sampling and Analysis of Ozone Precursors" recommend tracking the historical contamination level of canisters and pulling canisters that contained the most highly contaminated samples for certification. ARB staff person Steve Madden stated that he had recommended or was planning to recommend tracking canisters to ensure that all canisters at some point are certified through the random pull process which would serve a similar objective.

Recommendation: A random pull of canisters is currently used to select canisters cleaned in each batch for certification. ARB may want to consider other options such as that proposed by it's staff to ensure all canisters eventually go through the certification process or alternatively select the canisters with the highest prior sample concentrations for certification based on a tracking system.

Finding OL20: Canisters are not vented in hoods and are vented to ambient air.

Discussion: It is good laboratory practice to release sample air including ambient air in a hood to avoid the potential for contributing to air contamination.

Recommendation: It is recommended that unused sample in canisters be released in a hood.

Finding OL21: The laboratory has not established a retention time for canisters after they have been certified. The laboratory relies on the canister pressure gauge reading as an indication the canisters have not lost vacuum.

Discussion: Pressure gauge monitoring after canister shipment to the field following cleaning and certification is a good quality assurance measure for ensuring significant vacuum loss has not occurred. Establishing a retention time policy for canisters stored at the laboratory after they have been cleaned and certified would add additional assurance that canisters have not become contaminated over time through smaller leaks.

Recommendation: It is recommended that the laboratory establish a retention time policy for canisters after they have been cleaned after which they will be re-cleaned and

certified as an added quality assurance measure they have not become contaminated. A retention time of 30 days would be reasonable. Alternatively, it is recommended that language be included in the Quality Assurance Plan that all canisters are used and recycled within 30 days if such is the workload.

DATA MANAGEMENT

Introduction

A primary goal of the U.S. Environmental Protection Agency's Quality System is "to ensure that environmental programs and decisions are supported by data of the type and quality needed for their intended use…" (EPA Quality Manual for Environmental Programs, EPA Order 5360A1 (EPA, 2000a)). Achievment of this goal involves planning, implementation and assessment of the data collection process. Data verification and data validation are key steps in the assessment of environmental measurements. EPA defines data verification as the process of evaluating completeness, correctness and compliance of a data set against the method requirements. Data validation extends the verification process to determine the analytical quality of a data set. As a part of this TSA, EPA evaluated the ARB's data handling, verification, validation, storage and upload to AQS of ambient monitoring measurements generated from within their quality assurance system.

California has five organizational units in two different Divisions of the ARB and 26 separate Air Pollution Control Districts through which ambient monitoring data enters EPA's AQS database. Responsibility for managing the state's CAA-required ambient monitoring data is divided between the following groups:

1) ARB-Operated Field Monitoring Stations Data - Air Quality Surveillance Branch, Ken Stroud, Manager (Monitoring & Laboratory Division)

2) Laboratory Analytical Data - Northern Laboratory Branch, Mike Poore, Manager (Monitoring & Laboratory Division)

3) Quality Assurance Performance Audit Program Data – Quality Assurance Section, Merrin Wright, Manager (Monitoring & Laboratory Division)

4) Special Purpose Monitoring Projects- Operations Planning and Assessment Section, Jeff Wright, Manager (Monitoring & Laboratory Division)

5) Local District-Operated Monitoring Station Data - Air Quality Data Section, Ron Rothacker, Manager (Planning & Technical Support Division)

6) Local District-Operated and Local District-AQS-uploaded Data - various Districts

The ARB has defined procedures in place for handling internal data from the time of acquisition to the time when it is submitted to the U.S. EPA. The procedures are well known to the principal data providers and reviewers within ARB.

ARB-Operated Field Monitoring Stations Data Management

The ambient monitoring stations operated by ARB staff directly are under the management of Ken Stroud, Chief,Air Quality Surveillance Branch. In the branch, there are three regional Supervisors: Deborah Popejoy (Northern), Curt Schreiber (Southern), Gary Zimmerman (Central). The Air Quality Specialists interviewed on June 13, 2007 for this TSA on this section were:

Norma Montez
Joseph Cruz
Greg Frye (via conference call, 9/06/07)

Air quality data measured by the continuous analyzers at the field stations operated and maintained by ARB are stored in data loggers and station computers. Each station is polled hourly by modem and the data are transmitted directly to the ARB's central computer system in Sacramento. The computer system consists of a server located within an ARB-owned facility and a second backup server located in a separate, leased facility. The data are housed in the Air Quality Data Acquisition System (AQDAS). The AQDAS (now AQDAS-2) is ARB's primary data repository for ambient measurements and data validation tool for data obtained at ARB-operated stations. AQDAS was developed in-house by ARB staff. Data is retained in AQDAS for 180 days by which time it has been uploaded to AQS and from AQS, downloaded to the ARB database Air Data Management System (ADAM). ADAM is ARB's official state database for ambient air quality data. Chart recorders and data loggers located at each station provide a supplemental record for the data validation process.

The first review of the data is performed by the ARB station operators. The ARB QA Manual Volume II contains data acquisition procedures, including instructions for conducting the level one data validation. For data in need of correction, the station operator makes a notation on the data logger or chart recorder at the station. The AQDAS has data verification and validation capability to aid flagging of suspect data. Flags that are generated by station operators or information describing the data being processed are included in the database. Data corrections are reviewed and validated by the Section Specialist who approves all data corrections and recommends implementation of corrections. The data stream then proceeds to the next level of review by the section supervisor.

At this point in the process a final data validation summary is produced. The monthly data report is sent to the Branch Chief for approval. Once approved, the data are stored in the state archive system and submitted to the U.S. EPA's AQS database.

The Air Quality Surveillance Branch (AQSB) Section Specialists, responsible for upload of the ARB-collected ambient data to EPA's AQS database, has all the relevant and up-to-date AQS manuals.

Little or no data would be lost in the event of significant computer problems due to the redundant data backup systems maintained at the air monitoring stations and on the two computer system servers.

ARB does utilize a flagging system to identify data outside of expected levels and anomalous flow-rate changes. This flagging system is not formally documented in a control-copied SOP. The second level review process relies on the AQDA protocol to provide corrective actions in the system.

Second-level review for all stations is carried out by Section Specialists, Norma Montez and Joseph Cruz. Following the second level review and any corrections to data, the section supervisor reviews data from their stations on a monthly basis and Ken Stroud signs off on the data and approves data package for upload to AQS by Norma Montez.

ARB submits all required data to the U.S. EPA's AQS database including concentrations for all criteria pollutants, supporting precision and accuracy information.

Laboratory Analytical Data Management

Among its many responsibilities to the ARB organization, the Northern Laboratory Branch is responsible for mass determinations for PM2.5 and PM10, chemical speciation analysis, air toxics analysis and VOC and carbonyl analysis according to the PAMS program-required sampling methods. The Northern Laboratory Branch is located in Sacramento and is managed by Mike Poore.

Staff and managers from the laboratory interviewed on June 13,2007 for the data management section of this report included:

Mike Poore
Kathy Gill
Dan Tackett
Samantha Scola
W. Howard Bakes
Sean S. Roy

All lab analyses are stored in the ARB's Laboratory Information Management System or LIMS. The original LIMS was a product purchased from Perkin-Elmer but the system has had many modifications to customize it for use by ARB over the years.

The LIMS database is housed in the Monitoring and Laboratory Division and is backed up once per week to tape. It is accessed by all chemists and managers. The system makes use of limited access and password-protection for security. The raw data in the system is stored for five years. Data from the LIMS is uploaded to the AQS database by Samantha Scola and Sean Roy on a weekly basis.

Data flow in the laboratory begins with the chemist running the analytical method and generating measurement data (gravimetric or chemical analysis). Data goes from the analytical instrument to the LIMS. LIMS assigns QC flags as defined by ARB SOPs. All data are subjected to peer review for level two data validation followed by reviewing and 'locking' of the data by lab managers. Data peer-review groups are organized around the analytical methods: PM10, PM2.5, PM2.5 speciation, TSP-lead. The QC criteria as written in the laboratory and analytical methods are used for data validation.

Quality Assurance Performance Evaluation Audit Data Management

The Quality Assurance Section in the Monitoring and Laboratories Division conducts performance evaluation audits and technical system audits at ambient air monitoring stations throughout the state. Performance audits are conducted annually of each local air pollution control district for gaseous criteria pollutant monitoring and particulate matter monitoring flow audits. The results of the audits are maintained online on the ARB website and are also uploaded to AQS in most cases. In some instances, the ARB has not received update rights to some local District's screening files in AQS.

EPA conducts an annual intercomparison with the ARB audit vehicles to ensure comparability with EPA's National Performance Audit Program (NPAP) and Performance Evaluation Program (PEP).

Special Purpose Monitoring Data Management

The Operations Planning and Assessment Section, which is in the Quality Management Branch of the Monitoring and Laboratory Division, conducts special purpose monitoring projects on an as-needed basis. This section is responsible for covering emerging issues in air monitoring. In most cases the measurement data are uploaded to AQS.

EPA was not given access to interview staff in this section about data management practices.

Local-District collected-ARB Upload to AQS Data Management

The Air Quality Data Section, of the Air Quality Data Branch in the Planning and Technical Support Division, is the organization responsible for uploading ARB's continuous particulate matter data and all meteorology data to AQS. In addition, the AQDS also uploads data from those local Districts which submit only hardcopy data and the gaseous criteria pollutant monitoring data from local Districts without direct access to AQS. The AQDS is located in Sacramento and is managed by Ron Rothacker.

The indivduals interviewed on July 19, 2007 about data managed by AQDS were:

Karen Magliano, Manager, Air Quality Data Branch
Ron Rothacker, Manager, Air Quality Data Section
Pheng Lee, Air Pollution Specialist

Data is received electronically by email or as hard copy through the mail from 10 different local Districts.

One of the AQDS' primary functions is to review and upload hourly data produced at ARB monitoring sites and data submitted by local Districts without direct access into AQS (Glenn County APCD, Lake County AQMD, Mendocino County APCD, Northern Sonoma APCD, Placer County APCD, Sacramento Metropolitan AQMD, Shasta County AQMD, Siskiyou County APCD, Tehama County APCD and Yolo-Solano AQMD). The type of data uploaded for these Districts include gaseous criteria pollutant, continuous particulate matter and meteorological data.

Air Quality Data Action (AQDA) reports based upon performance audits are produced by QAS. These reports are provided to the Districts for follow-up within 30 days and to AQDS to inform them of data requiring attention by the Districts. The Districts must respond within 30 days. If the response is acceptable to QAS, the AQDA is completed, signed, dated, and forwarded to the AQD Section for appropriate action, i.e., data correction, acceptance, or deletion for the affected time period. No changes are made to District data without their knowledge and consent. Further follow-up is performed by QAS if deficiencies remain.

A User's Guide (manual) was developed by AQDS providing instructions on data receipt and input into AQS. The data checks performed by AQDS are primarily for historical highs, duplicate data and to ensure a monitor is defined in AQS.

Local District-Collected/Local District-Uploaded-to-AQS Data Management

The local Districts reviewed as part of this TSA include Northern Sierra AQMD, San Joaquin Valley APCD and Great Basin Unified APCD.

The reporting of data into AQS by GBUAPCD was agreed upon by a Memorandum of Understanding that was signed by the District, the ARB and U.S. EPA in 2002. The level of QA data review performed by the GBUAPCD is extensive and documented in the District's QAPPs.

Based on interviews of the AQDS staff, it is clear that they are not familiar with the QA/QC review practices performed in the Districts and whether those practices are in compliance with ARB's practises.

FINDINGS

Finding DM1: The data validation and review/verification procedures for the Air Quality Surveillance Branch are not formally published in a control-copied SOP.

Discussion: ?

Recommendation: ?

Finding DM2: The data validation and data review/verification procedures for the Northern Laboratory Branch are not formally published in control-copied SOPs.

Discussion: ?

Recommendation: ?

Finding DM3: The data validation and data review/verification procedures for the Air Quality Data Section are not formally published in a control-copied SOP.

Discussion: ?

Recommendation: ?

Finding DM4: EPA was not given access to special projects data management activities to review. It is not clear that QA procedures apply to all projects receiving federal funding.

Discussion: ?

Recommendation: ?

Finding DM5: The AQDS does not ensure that local District data is validated prior to upload to AQS.

Discussion: ?

The following information is from Meredith's write-up on NSAQMD. It seems like it would fit into the discussion of this finding.

> At the NSAQMD, automated instrument outputs are telemetered to the District office. The monitoring manager reviews the ozone data and then submits these data directly to AQS with no additional QA checks.

Finding DM6: Ambient monitoring data submitted to the AQS database by the ARB PQAO is not being annually certified.

Discussion: 40 CFR Part 58.15 requires data to be certified by a specific date i.e., coincident with annual summary report which until 2009 is due by July 1 of each year; beginning in 2010, the annual data certification letter is due by May 1 of each year. Since the data is considered certified, official, and not subject to change after submittal of the certification letter, the changing of the data at a later date is a significant concern as the expectation by all is that the data will not change and can be used for attainment and decision making purposes. Data verification should take place before upload to AQS, not after, when it has the potential to impact numerous organizations prior decisions.

Recommendation: All data changes and certification should take place consistent with deadlines established in Part 58.15.

These finding from the Great Basin write-up seems like they would fit better here than in operations.

> **Finding:** ARB does not review GBUAPCD's data prior to its upload to AQS.
>
> **Discussion:** ARB does not review the monitoring data from the GBUAPCD's network.
>
> **Recommendation:** See Finding GB1.
>
> **Finding:** Annual certification of the GBUAPCD's monitoring data in AQS is not being done.
>
> **Discussion:** The certification of ambient monitoring data in AQS by the air pollution control official responsible is required on an annual basis. Review of the database from 2000-2006 shows no annual certifications in AQS.
>
> **Recommendation:** GBUAPCD should submit the annual certification letter and required AMP350 and AMP450 reports from AQS to EPA Region 9.

Finding DM7: Staff do not have free access to surface communication concerns related to quality assurance to maximize organization efficiencies.

Discussion: Staff were curtailed or discouraged to freely respond to questions regarding improvements that could be achieved. The purpose of conducting audits is to improve areas of deficiencies, if they are present. Because staff are more closely involved with the day to day operations, they are generally in a good position to recommend practices for improvement.

Recommendation: Staff should be encouraged to access management beyond their chain of command to communicate, including auditors, of concerns or functions that could use improvement.

Finding DM8: Valid concentration data for the Yreka PM2.5 monitor (AQS# 06-093-2001) have not been submitted to the AQS database since December 2006.

Discussion: Based on the null value codes in the AQS database, it appears that this monitor began malfunctioning in November 2006 and from December 13, 2006 through July 2007 has not submitted any data to AQS. Null value codes of "machine malfunction" and "scheduled but not collected" have been consistently entered into AQS during this period. While this monitor is not required under EPA regulations, the ARB has designated it as a SLAMS site. SLAMS sites should meet a data capture rate of 75%.

Recommendation: The ARB should work with the Siskiyou County APCD to determine the reason for the poor data capture at this monitoring site and implement appropriate corrective actions to ensure a data capture rate of at least 75%.

Finding DM9: The AQS database identifies the Siskiyou County APCD as its own PQAO.

Discussion: Two sites in Siskiyou County, Mount Shasta (AQS# 06-093-0004) and Lava Beds National Monument (AQS# 06-093-0005) are listed as being part of the Siskiyou County PQAO. According to the ARB 2007 S&L Monitoring Network Plan, Mount Shasta is operated by Siskiyou County APCD; therefore it should be listed as part of the ARB PQAO. Lava Beds National Monument is operated by the National Park Service. Depending on the specifics on how this monitor is operated, whether it is audited by ARB and which laboratory performs the mass analysis of filters, this monitor's PQAO association should be verified.

Recommendation: The ARB should work with EPA to ensure that the monitors in the ARB PQAO are correctly identified in the AQS database.

Finding DM10: The Lakeport PM10 site has not reported PM10 data correctly to AQS since March 2001.

Discussion: Beginning in April 2001, PM10 data from the Lakeport monitoring site (AQS# 06-033-3001) has been submitted to the AQS database under the local condition parameter (AQS code 85101) rather than under the standard Temperature and pressure parameter (AQS code 81102). The PM10 NAAQS requires data to be adjusted to Standard Temperature and Pressure conditions (See 40 CFR 50, Appendix J, section 11).

Recommendation: The ARB PQAO needs to ensure that PM10 data is submitted to the AQS database under the appropriate parameter codes. The ARB should review the PM10 data from the Lakeport monitoring site to determine if PM10 data at local conditions was correctly submitted to the AQS database. If this is the case, the PM10 concentrations will need to be recalculated according to the procedures in 40 CFR 50, Appendix J and resubmitted to AQS under the correct parameter code. Alternatively, the data in AQS may already be corrected to Standard Temperature and Pressure and simply incorrectly submitted under the wrong AQS parameter code.

QUALITY ASSURANCE

Introduction

The Quality Management Branch (QMB) is composed of two sections: the Quality Assurance Section (QAS) and Operations Planning and Assessment (OPA). The ARB's Standards Laboratory is part of the QAS. EPA auditors interviewed Jeff Cook, QMB manager and Don Hammond of his staff, Merrin Wright, Manager of the Quality Assurance Section (QAS) and Donald Fitzell and Long Liu of her staff, Brian Spreadborough and Robert Russell, leaders of the Standards Laboratory, and Jeff Wright, manager of the OPA Section

The QAS's primary responsibilities include:

- Conducting performance audits of ARB-MLD and District monitoring instruments;
- Periodic assessments of air monitoring laboratories' capabilities through analysis of interlaboratory standards or whole air samples (these are sent to all California Photochemical Assessment Monitoring laboratories. Other laboratories that perform hydrocarbon analyses may also choose to participate.);
- Assisting with system audits of air California air districts;
- Updating standard operating procedures (SOPs) specific to the QAS's activities;
- Validating ARB-MLD's field generated monitoring data (accuracy assessments);
- Preparation of annual reports on the status of QA activities occurring in ARB-MLD.
- Preparation of data quality summary reports for Reporting Organizations and Districts in California.

The Standards Laboratory provides standards certifications for gaseous and flow transfer standards. Standards certifications are performed for all ARB-MLD Sections' gaseous and flow transfer standards. Some California Districts also choose to employ these services.

The OPA section is responsible for Board wide issues including review of MLD laboratory performance to help ensure defensible laboratory data and oversight of and planning for special purpose monitoring.

QA related functions are also complemented and performed in the Air Quality Surveillance Branch's (AQSB) Operations Support Section (OSS) and Northern Laboratory Branch (NLB), both within the Monitoring and Laboratory Division. The Planning and Technical Support Division (PTSD) also has a QA role in reviewing ambient data collected by ARB-MLD and some Districts and works with QAS to ensure that only validated data are reported to EPA's Air Quality Subsystem (AQS) database.

The AQSB performs several quality management functions. These include:

- Developing and administering the training program for instrument operators;
- Performing instrument certifications;
- Validating ARB-MLD's field generated monitoring data (precision assessments);
- Maintaining a system for formal corrective actions;
- Preparing and reviewing SOPs for the air monitoring program.

Training and instrument certifications are the responsibilities of the Operations Support Section (OSS) within AQSB. The OSS also provides independent review and approval of field SOPs. OSS's other responsibilities includes instrument repair and technical support. However, while support (training, field procedures, and other technical support) is available to the all local Districts in California, the AQSB's role is not to actively manage the Districts' field monitoring quality systems nor does the AQSB have the resources to do so.

The Northern Laboratory Branch develops laboratory and ambient air collection test procedures, performs near source ambient air monitoring, conducts analyses of ambient air samples and consumer products, and provides technical assistance to clients. It performs self assessments each quarter and produces a quality control summary report that is provided to the Division chief.

As observed and confirmed during interviews, QA related functions are incorporated throughout the ARB's air monitoring operations. However, since the QA activities and responsibilities are spread among different offices and branches within the ARB, it is difficult for the QA activities to be coordinated by the QMB and, based on EPA's interviews with QMB staff, the scope and organization of these various QA activities is not fully understood by the Quality Management Branch (QMB). The efficiency and efficacy of the existing decentralized system could be improved with the QMB or another entity having a more authoritative, central, and leadership role. For example, internal checks conducted by QAS do not require written corrective action responses (Performance audit dated June 7, 2007, Ambient Air Toxics Laboratory Comparison Check Results). QMB's authority is diminished when no corrective action response is required. With the exception of Air Quality Data Action (AQDA) forms issued primarily out of the QAS and the technical bulletins from the AQSB, corrective action documentation was not sufficient. Minimally, recommendations for corrective action and responses to them should be addressed in writing.

An example of an activity that needs better coordination is the guest instrument certification/calibration procedure. Currently, when a guest instrument fails a calibration of certification, the Standards Laboratory is not required to report this failure to the ARB field auditors or the ARB data reviewers. If this procedure were revised to require the reporting of the results of the certification/calibration procedure it would allow QAS and AQSB to address the consequences of these failures. For example, this information would be useful to QAS during future instrument performance audits and to AQSB for

determining whether data produced prior to failure should be rejected or more closely reviewed.

The QMB staff is not aware of the extent to which QA activities are performed in the Districts. The Districts in the ARB PQAO are expected to follow ARB-MLD's Quality Assurance Plan (QAP). No records of regular system audits to ensure that the Districts were in conformance with the plan were available. See Finding QA3 below.

In order to determine the effectiveness and efficiency of the ARB's QA system, a regular schedule of system audits by QMB, or other centralized quality management entity, of the ARB and local district ambient air monitoring programs is recommended for capturing deviations from the ARB QA plan and to insure ongoing quality improvement.

The role, responsibilities, and authority of the QAS to ensure data quality needs to be reemphasized and acknowledged within the organization, including the Districts within the ARB PQAO. The QAS recommendations should be documented along with the expectation that corrective action responses should be provided until satisfactory closure is reached.

The ARB has all the necessary components for an effective and robust QA system. Each Division involved in the collection and reporting of ambient air data understands and performs QA. A QMP is already in place to ensure QA/QC practices are adhered to or improved upon, and the QMB is in a position to potentially provide an authoritative oversight role. The ARB management's reemphasis and support of QMB's authority will help to develop a stronger more comprehensive QA system within the ARB-MLD and the Districts in its PQAO.

General Quality Management

Finding QM1: The QMB does not have the authority in the organization to provide direction and recommendations to the data collection, production, and verification programs.

Discussion: Although QMB is independent and centrally situated in the ARB's organization chart, the Branches appear to be self directed in the QA they will perform, independent of any recommendations QMB may have. Functionally, in addition to QMB, QA is performed in the Northern Laboratory Branch, Air Quality Surveillance Branch and its Operations Support Section. QMB has attempted to perform QA oversight and there are some records of reviews (e.g., performance audits of the Northern and Southern Laboratory Branch, whole air interlaboratory comparison checks). No records in response to QAS reports were available and it was noted by QAS that report recipients only need to consider recommendations made by them, and there is no requirement that recipients respond in writing. This lack of centralized quality management authority and Branches acting independently of one another and not towards

a comprehensive goal, does not result in an effective quality assurance program for the organization. To this end 40 CFR Part 58, Appendix A, Section 2.2, requires that each ambient air monitoring organization have an independent quality assurance function that is responsible for the effective implementation of the ***overall*** quality assurance operations of the organization.

In an organization the size of the ARB, quality management should be the primary function of a centralized office such as QMB as established by the ARB. This is to ensure that all QA/QC related activities and concerns are addressed with staff and resolved in the ARB and Districts.

Recommendation: Empowering the QMB with quality management authority in the ARB and Districts for recommending and ensuring the production of quality data needs will help to reestablish the QMB's central, independent, and authoritative role in the organization. Its role should be to establish a unified, structured, comprehensive QA program in the ARB that includes overseeing (approving) the QA/QC activities conducted in the field, information management, and laboratory operations.

To fully implement such a program, internal audits, in addition to audits conducted by EPA, should also be conducted to capture any deviations from ARB and EPA QA requirements not addressed in this report. This would enable QMB to develop and administer a comprehensive QA system that is not independently operated in the Branches and Districts, but led by QMB. Based on this self assessment, training programs should be developed. Communication channels should also be evaluated to ensure efficient exchange of QA related information (e.g., changes in EPA's monitoring regulations) and that matters raised are acted upon and responded to in a timely manner.

The authority and responsibilities of the QMB should include the provision for effective training, technical assistance and guidance (for developing quality assurance project plans, standard operating procedures, etc.), data collection plan approvals, and the performance of self assessments and audits of Branches involved in data collection, production, or verification. The QMB should also be available to provide guidance to Districts that report AQS information to the ARB.

Finding QM2: Training, while in place for the ARB MLD, does not necessarily extend to all staff and the ARB PQAO Districts. See also Finding M1.

Discussion: The QAS and the AQSB (through the OSS) have implemented training programs, which are in place but still being refined. EPA believes these programs are very beneficial and encourages the ARB MLD to continue these programs as well as other training programs in place. We believe that rather than the two groups developing QA training separately, it would be more efficient and easier to coordinate a central training and evaluation program that represents the entire PQAO to ensure that all monitoring staff receive adequate and consistent QA training.

Recommendation: The ARB should ensure that the AQSB and QAS coordinate their training programs. One way to achieve this is to develop a centrally administered training program that includes both operations and QA activities.

Finding QM3: Some Districts do not have a central, independent, dedicated quality assurance manager/officer responsible for communicating and ensuring that quality assurance activities are carried out in field operations and information management.

Discussion: Two of the Districts evaluated as part of this TSA, the San Joaquin Valley APCD and the Northern Sierra AQMD have no staff assigned to perform QA oversight of their operations. 40 CFR, Part 58, Appendix A, Section 2.2, requires that each ambient air monitoring organization have an independent quality assurance function. While the ARB performs some functions, such as the annual certification of the ozone standard, and flow audits, there are many QA functions not being performed. These include

- Periodic audits of the quality management system (management system reviews), routine procedures, and data quality to identify areas of improvement and to ensure that monitoring programs continue to consistently follow sound and documented procedures.

- The routine review and tracking of precision and accuracy data.

Recommendation: The ARB needs to perform an evaluation of District QA management activities. Some Districts, such as Great Basin Unified APCD, perform their own QA management activities and would probably only require periodic assessments to ensure they continue to meet the ARB and EPA QA requirements. Other Districts programs will need the ARB to play a more active role in QA management.

QA Section

Finding QA1: The QAS does not assure that sites that fail performance audits are re-tested after a corrective action is implemented.

Discussion: The QAS will make an effort to re-test sites based on their field schedule. In practice sites that are far from the Sacramento office do not get retested because it is prohibitively labor and resource intensive.

Recommendation: The QAS should establish criteria when retesting is needed based on the necessity of data and/or develop an alternative to sending their audit trailer based system to retest sites.

Finding QA2: The QAS has experienced a high staff turnover in recent years, which has impacted the level of institutional knowledge in the section and impacted their ability to perform audits.

Discussion: The QAS has responsibility for performance and site audits across the ARB PQAO. This is one of the few threads of consistency that the PQAO has and, as such, is a critical operation. Additionally, instrument and site problems encountered during the audits sometimes require a detailed knowledge of air monitoring operation across a diverse range of equipment. This knowledge is needed to:

- Correct problems encountered conducting audits;
- Judge the site operator's abilities to correct deficiencies needed for re-testing sites;
- Evaluate siting and instrument configuration issues;
- Demonstrate to District personnel that audit failures are due to site problems rather than improper auditing.

Additionally, some audits have been canceled due to insufficient trained staff.

Recommendation: The ARB MLD needs to develop a plan to reduce turnover in QA audit staff and/or attract more senior staff to the QA Section.

Finding QA3: System audits of local Districts by QAS and the Stationary Source Division are only conducted by request or on an as needed basis.

Discussion: The frequency for performing system audits are documented on www.arb.ca.gov/audits/schedule.pdf. However, upon review of ARB-MLD's Annual Data Quality Report and interview, system audits are performed by request or on an as needed basis. The program areas reviewed during these audits are also dissimilar to EPA's definition of system audits, focusing on program elements (compliance, permitting, rule development, hot spots, emission inventory, ambient air programs) although the QAS audit checklist is inclusive of both program and QA elements. Both should be reviewed.

Recommendation: Future system audits should be performed as identified on the ARB-MLD's website cited above. The audits should be inclusive of both program and QA activities reviewed and conducted using ARB-MLD's Audit procedures contained in Volume V, Appendix AH3.0, System Audit Procedures for Ambient Air Monitoring Programs, August 2002.

Finding QA4: ARB MLD does not perform routine audits of data quality.

Discussion: EPA QA/R-5, EPA Requirement for Quality Assurance Project Plans, discusses assessments that should be elements of a quality management program. These include, "surveillance, management systems reviews, readiness reviews, technical systems audits, performance evaluations, audits of data quality, and data quality assessments." Audits of data quality include periodic checks of a small portion of the

data produced to ensure that the data set was collected as specified by regulations and the QA planning documents, it included all the appropriate supporting documentation, all supporting data calculations were correct, and the validation was properly performed.

Recommendation: ARB should develop a schedule and procedure for conducting audits of data quality.

Finding QA5: Internal audits are not conducted on ARB-MLD's and Districts data management, reduction and review process.

Discussion: Results of reviews for both ARB-MLD and District produced data are reported into the AQS database. It is important that QAS develop procedures for conducting internal audits of ARB-MLD and Districts data reduction and review for several reasons:

- To ensure the data reduction and review is satisfactory;
- To ensure that the quality of data for both ARB-MLD and District data is verified and known when submitted to the AQS database; and
- To ensure results reported to the AQS database can be used by those accessing the information.

Recommendation: Internal audits should be conducted as soon as practicable, and on a scheduled frequency. Longer term, SOPs should be developed for conducting internal audits of ARB-MLD's and Districts data management, reduction and review process.

Finding QA6: The ARB's MLD does not routinely conduct monthly (day-to-day) checks of all the precision and accuracy of data being uploaded by the local Districts to the AQS database.

Discussion: It is commendable that the ARB-MLD produces annual reporting for precision (nightly zero and span for gases and flow rates for particulate matter) and accuracy reports combining ARB-MLD and District sites. While the ARB does perform this monthly check for those Districts that request it, there is much data being uploaded to the AQS database that have not been reviewed. Since the annual precision and accuracy (P&A) report by the ARB-MLD occurs after all the data from the ARB PQAO sites are reported to AQS, the pooling and averaging of data collected over a year may smooth out or mask any P&A criteria failures specific to a site. To more timely identify P&A anomalies, day-to-day examination of ARB-MLD and all District monthly reported data should occur.

Recommendation: The ARB-MLD, as the primary quality assurance organization, should develop new SOPs (or revise existing ones) to include day-to-day check routines for District produced data. The "script" for performing these checks can be provided to Districts for incorporation into their data review computer program to enable the process

to be automated. This is to ensure that all of the daily data reported to AQS meet the precision and accuracy criteria established at 40 CFR Part 58, Appendix A, Section 2.3, and that precision and accuracy reporting is performed consistently throughout the organizations that compose the PQAO.

It is further recommended that standard operating procedures be developed for performing these precision and accuracy checks on a monthly basis. These SOPs should include a step to check results of the annual performance audits against daily precision and accuracy results of the station to ensure they agree, and designate the personnel responsible for doing so. If there is disagreement, procedures for qualifying data and reporting to QAS should be developed.

Finding QA7: The ARB Reporting Organization (RO)[8] cannot access the AQS accounts of Districts that are part of the ARB PQAO, but are their own RO for the purposes of uploading data to the EPA AQS database.

Discussion: Each RO must be consulted to obtain permission to submit data for the sites operated by the RO to the AQS database. There have been complications for the MLD QA Section and others involved in central PQAO activities in gaining access to the screening files that would allow them to submit data to the AQS database for dependent ROs. For a PQAO to function properly the central QA and Data managers need to be able to access the data files in the AQS database.

Recommendation: Over the short term ARB should work with the RO's in the ARB PQO to facilitate obtaining access. Over the long term EPA Region 9 can work with OAQPS to develop AQS access procedures, consistent with data quality objectives, for PQAO's with multiple ROs.

Standards Laboratory

The MLD's Standards Laboratory is part of the QAS. EPA staff evaluated the Standards Laboratory's primary pollutant operations on June 26 and its operations involving the verification of flow measurement devices on August 2, 2007. Individuals interviewed during the audit were Brian Spreadborough and Robert Russell. Mr. Spreadborough leads the ozone primary and transfer standards lab. Mr. Robert Russell leads the primary and transfer standard laboratory for certification and verification of gaseous criteria pollutants, particulate matter, toxic air contaminants and hydrocarbon pollutants. Mr. Russell and Mr. Spreadborough can perform one another's respective responsibilities. They also oversee two student interns Trisha San Juan and Nick Barker who are called to perform flow calibrations as needed based on workload. Both Mr.

[8] EPA defines a "Reporting Organization" as an agency that has editing rights for a subset of monitors reporting data to EPA's AQS database. The reporting organization associated with a subset of monitors is the only organization that can upload data to the AQS database for those monitors, though other AQS users have read-only rights to the data.

Russell and Mr. Spreadborough perform a final check of results of each others work before they are released. Hard copy and electronic records of the calibrations and verifications are maintained in the Standards Laboratory.

The Standards Laboratory performs verifications of ozone and flow rate primary standards, calibrations and certifications of ozone and flow transfer standards, and certification of compressed gas cylinders. NIST traceable standard and certified reference materials are used to certify primary and transfer flow standards for the ARB and Districts which submit their standards for certification and verification. Traceability is defined in 40CFR Parts 50 and 58 as meaning ". . . that a local standard has been compared and certified, either directly or via not more than one intermediate standard, to a primary standard such as a National Institute of Standards and Technology Standard Reference Material (NIST SRM or a US EPA/NIST-approved Certified Reference Material (CRM). The Standards Laboratory performs calibration and certification for gaseous criteria pollutants and particulate matter for the following districts:

- Bay Area AQMD,
- Great Basin Unified APCD,
- Lake County AQMD,
- Mendocino County APCD,
- Monterey Bay Unified APCD,
- Northern Sonoma County APCD,
- Placer County APCD,
- Sacramento Metroploitan AQMD,
- San Diego County APCD,
- San Luis Obispo Caounty APCD,
- Santa Barbara County APCD,
- Shasta County AQMD,
- Siskiyou County APCD,
- Tehama County APCD,
- Ventura County APCD, and
- Yolo/Solano AQMD

The flow standards are received by the Standards Laboratory either directly (hand carried in), by mail, or by courier. The standards are signed in, certification or calibration performed on a first come, first served basis with a turnaround time of up to three weeks. The following must be satisfied for calibration, certification, or verification:

Ozone

Certification of transfer standards requires six acceptable comparisons against the EPA/NIST Standard Reference Photometer (SRP). Each comparison must have a correlation coefficient of 0.9999 or greater, each slope must be within 5 percent of the expected value, and each intercept must be less than 3 ppb ozone. A certification is valid if the six most recent comparisons have a Relative Standard Deviation of less than 1.5%

for the slope and a Full Scale Relative Standard Deviation less than 0.5 percent for the intercept. For recertifications, the current comparison's slope must be within 1 percent of the most recent comparison's slope, otherwise, another comparison must be performed to verify the change. The certified slope and intercept is the average of each of the six comparisons and should be used by the client to correct or adjust the instrument's displayed ozone concentration. EPA requires reproducibility of 2 times the coefficient of variation (40 CFR Part 50, App B, Section 7.8.3)

Verification of an ozone primary standard consists of one acceptable comparison against the SRP that is maintained by the ARB. For the verification to be valid, the linear regression must have a correlation coefficient of 0.9999 or greater, the slope must be within 3 percent of the expected value, and the intercept must be less than 3 parts per billion (ppb) ozone.

Low-Volume Flows (0.005 to 50 lpm)

Prior to calibrating or verifying the guest device under test (GDUT) instrument, a calibration check is performed by the Standards Laboratory to ensure the primary flow standard instrument is within the ARB's specifications. These checks include: leak check, tare value is stable (zeroed), and temperature. Upon satisfactory check, they commence with the calibration or verification of the GDUT and electronically capture the output on the display panel of the GDUT. Results are read directly off the GDUT display panel and entered into an electronic database system (DBASE). Access to the database system is password protected and limited to Mr. Russell and Mr. Spreadborough. It was noted that DBASE would soon be updated.

A calibration consists of one comparison against a primary flow calibrator. The comparison must have a linear regression with a correlation coefficient of 0.9999 or greater. The derived slope and intercept should be used by the client to correct or adjust the instrument's displayed flow rate.

Certifications require four consecutive comparisons against a primary flow calibrator. It is preferred to alternate primary flow calibrators for each comparison. Each comparison must have a linear regression with a correlation coefficient of 0.9999 or greater. A certification or recertification is valid if the four most recent comparisons have a RSD less than 1 percent for the slope and FRSD less than 1 percent for the intercept. For recertification's, the current comparison's slope must be within 1 percent of the most recent comparison's slope, otherwise, another comparison must be performed to verify the change. The certified slope and intercept is the average of each for the four comparisons and should be used by the client to correct or adjust the instrument's displayed flow rate.

Verifications consists of one multi-point comparison against one of two primary flow calibrators: Molbox/MolblocA or Molbox/MolblocB Flow Calibrator. For a verification to be valid, the linear regression of the comparison must have a correlation

coefficient of 0.9999 or greater, the slope must be within 3 percent of the expected value, and the intercept must be less than 1 percent (full scale) from the calibrator's intercept

High Volume Flows (566 to 2,360 lpm) for Particulate Matter

Certifications of high volume flows are performed with a Rootsmeter certified every two years by the original manufacturer. A certification or recertification is valid if the two most recent comparisons have a RSD less than 0.7 percent for the slope and intercept. In order for each comparison to be valid, all the points in the assay must be within 2 percent of the regression line. The certified slope and intercept is the average of each for the two comparisons. A slope and intercept is provided to determine both the Actual Flow (Qa) and Standard Flow (Qstd). EPA's acceptance criteria is +/-2% of NIST traceable standard, 40 CFR Part 50, App. L, Section 9.1, 9.2

The flow standard for particulate matter is recalibrated in house with a NIST certified primary standard #7 provided by US EPA. For a calibration to be satisfactory, the assay must have a correlation coefficient of better than 0.9999. Slope RSD % compared to the previous assay must be less than 0.7 %. Intercept FRSD % compared to the previous assay must be less than 0.7 %. Results are discussed with EPA and upon satisfactory determination, a recertification is issued to ARB.

In-house Certification checks.

Gaseous flow evaluations occur on a quarterly basis by the Standards Laboratory. These evaluations are referenced to a primary NIST traceable flow device. Eight molbox performance are checked using five different flow rates comprising the full calibration scale. The molbox performance is also cross checked against each other on an alternating cycle. The results from each level tested are pooled and averaged with prior three quarterly calibrations and correlation coefficient (CC) determined. For flow transfer standards, the relative standard deviation for the slope must be less than 1 percent and the intercept divided by full scale reading x 100 percent must be less than 1 percent for the last four calibrations.

The criteria used by the Standards Lab is tighter than that required by EPA in 40 CFR Part 50 (varies between 1 and 2% for flow controllers and meters, respectively). Any deviation from criteria are monitored and retested on the following day. If a shift exists and does not meet criteria, the primary standard is sent for recalibration and recertification by DH Instruments. A significant shift was determined in November of 2004 on two molboxes where the flow standard was sent to DH Instruments for recalibration. Upon return the instrument, a verification check was performed. The instrument was still found out of criteria and resubmitted to DH Instruments. The Standard Laboratory's verification check of DH Instruments calibration for this period was not available for review. It was noted by the Standard Laboratory manager that this would be prepared in the future.

The molbox flow transfer standards are sent out to DH Instruments on an annual or more frequent basis when degradation in instrument performance is observed as required in 40 CFR Part 50, Appendix L, Section 9.2.2.

Finding SL1: There is no corrective action procedure in place to notify Quality Assurance or Field Audit staff of failure i.e., potential rejection of data from period prior to calibration check taking place when transfer and flow standards fail calibration.

Discussion: The Standards Laboratory notifies the guest (ARB site manager or District) of failure, and that the failure must be remedied, prior to resubmission of standards. The same notice can be provided Quality Assurance and Field Audit staff to apprise them of the failure, potential impact on data collected prior to recalibration, and for monitoring during audits.

Recommendation: A reporting mechanism should be developed to communicate calibration/verification failures to Quality Assurance and Field Audit staff. Similarly QAS should develop procedures on how to evaluate and address data produced prior to the failures determined.

Finding SL2: The thermometer in the Standards Laboratory needs to be verified with another NIST traceable standard.

Discussion: While the calibration certification noted that the thermometer once calibrated does not require recalibration, verification is recommended to occur on a scheduled frequency e.g., annually. Annual calibration is suggested as this is the required frequency for standards. This is to ensure temperature recordings are accurate and do not lead to questioning on the validity of calibrations, certifications, or verifications performed by the Standards Laboratory that are dependent on temperature.

Recommended: Verify the thermometer against a NIST traceable standard on an annual basis when other instrumentation is recertified or recalibrated.

Finding SL3: There is insufficient documentation in logbook entries in the ozone Standards Laboratory.

Discussion: For traceability and the ability to recreate events, accurate and complete recording of logbook entries is essential. Some logbook entries were incomplete. For example, there is also no record of zero and span except on chart recorder. Documentation should include analyzer identification, date, calibration standard used and its traceability, identification of calibration equipment used, the individual conducting the span calibration, the unadjusted zero and drift span responses, the adjusted zero and span responses, calibration equation(s) (and curve, if prepared). Quality control charts are an excellent addition and form of documentation to graphically record and track calibration results, which was being performed (see comment 5 below). Zero and span documentation should be maintained both in a central file and at the monitoring site.

Instrument certification and maintenance log also contain sparse information, no identification of party making the entry from 1989 to present.

Recommendation: Complete and full descriptions of what was performed, captured, by whom, when, etc. should be documented in log books or log sheets.

Finding SL4: Calibration of the primary flow standards brought in by ARB staff or District does not always occur on an annual basis. There is no tracking by the Standard Laboratory to ensure District or ARB flow standards are annually recertified.

Discussion: 40 CFR Part 50, Appendix L, Section 9.2.2 and Volume II, Part 1, QA Handbook for Air Pollution Measurement Systems, Ambient Air Quality Monitoring Program, Quality System Development, EPA 454/R-98-004, August 1998 requires that the primary flow standard minimally be calibration annually. For example, for the Air Monitoring North site, the graseby variable orifice, bar code 107376, sn 5346 was brought in for certification on 02/25/04, 01/19/06 and 07/18/07. This instrument does not meet regulatory or handbook requirement.

Recommendation: ARB Field staff and Districts need to more cognizant of 40 CFR Part 50 recert/recal requirements to ensure they are not missed. This step should be included in a Standard Operating Procedure (SOP) for calibrations to ensure they occur on an annual or more frequent basis (where deviations occur before scheduled recalibration).

A method for tracking the submission of flow standards for recertification and calibration should be developed to ensure the standards are timely recertified or recalibrated and are producing defensible data. Consideration should be given to automated computer generated reminders to ARB sites and Districts.

Finding SL5: Manometers were not calibrated separately from transfer standards.

Discussion: Manometers are often changed out, and separated from the transfer standard that was sent in for certification. As this appears to be common practice, manometers should be calibrated separately to ensure that if they are "exchanged" out, there is a record to demonstrate that the manometer, despite being changed out satisfy certification criteria.

Recommendation: Manometers should be calibrated separately from transfer standard.

Finding SL6: The control charts for Hi Vol flow standard was above two standard deviations from approximately September 2005 and reached three standard deviation at approximately January 2006, before corrective measures were taken to bring it back into control.

Discussion: It is commendable the Standards Laboratory produces control charts to evaluate its own performance. As ARB is expected to establish and maintain "the

standard" for use in calibrating Districts and ARB-MLD flow standards, the Standards Laboratory should try to maintain its primary standard as close to one standard deviation, where possible.

Recommendation: Continue to produce control charts to self assess and monitor performance. Upon reaching 2 standard deviations, checks should be performed as to why this is occurring.

Finding SL7: The Standards Lab's High Volume Orifice Calibration Work Sheet is not always filled out completely. Similarly with logbooks, the person performing calibrations for the ozone standards is not recorded.

Discussion: To enable calibration tracking, the worksheet should be completed, especially noting which roots meter used to perform calibration, and which person performed the calibration of the ozone standards.

Recommendation: All Standard Laboratory worksheet entries should be completed, including identification of the party making the entries.

Finding SL8: Calibration records from DH Instruments, Inc. are not always opened upon receipt.

Discussion: Some records from 2006 (calibration report No. 48879, October 3, 2006 and 47162, July 12, 2006) indicate that the primary standard was out of tolerance. Results of recalibration should be opened and reviewed upon receipt. This is important to do as out of tolerance determinations may impact District and ARB generated data that has been submitted to AIRS. Notice should be issued to the impacted Districts and ARB site managers to communicate the out of tolerance situation found and its potential impact on data (whether data should be rejected, corrected; and from what point in time). Events where DH Instruments' evaluation reviewed indicated out of tolerance situations, DH concluded there was no expected impact on data quality.

Note in the introduction that Standards Laboratory personnel perform calibration checks on a quarterly basis. They also verify the primary standard meets ARB criteria after recalibrated by DH Instruments. These are both excellent practices to minimize loss of data. Records of the checks performed after recalibrated by DH Instruments were not available for review and would be maintained in the future (see comment 9).

Recommendation: Open and review calibration results from DH Instruments. Develop procedures to issue data impact notices, as appropriate.

Finding SL9: The Standard Laboratory does not maintain calibration verification records it performed on instruments recalibrated by DH Instruments.

Discussion: One of the standards was found out of criteria by the Standard Laboratory during its routine performance checks and was sent to DH Instruments for recalibration at

least two times before the standard was found in criteria by ARB-MLD. Rechecking upon receipt is excellent practice by the Standards Laboratory; they would not have otherwise caught the deviation from criteria. Records to demonstrate the instrument was tested for meeting calibration criteria upon return to the Standards Laboratory should be maintained.

Recommendation: Verification of calibration should be performed and records maintained.

Finding SL10: There is no backup to the stand alone DBASE database server that maintains records from results of calibrations performed of District and ARB-MLD sites.

Discussion: The database may be subject to failure as the software used to store records from calibration is DBASE. DBASE is no longer in production and not supported by the manufacturer. Currently, despite the system being only accessible to Standard Laboratory staff, DBASE failure or corruption of the database would require Standard Laboratory staff to laboriously go through each hard copy record and compare it against database records to ensure the electronic record is present and accurate. ARB-MLD noted that an updated software to maintain calibration records for the Districts and ARB would be obtained to avoid any potential DBASE failure.

Any database maintained at the regulatory level of ARB should have a automated overnight backup system, that is secure from corruption and access other than those authorized.

Recommendation: A back-up system needs to be developed along with standard operating procedures (SOPs) to implement it. While the backup system can be maintained on site, it is preferred that it be off-site in a secure, safe location, potentially in ADAM.

Finding SL11: Hard copy records of changes made to DBASE electronic data (see comment SL10 above) is not easily accessible.

Discussion: The database that contains results from calibration of District and ARB-MLD flow standards is capable of recording changes, however, the hard copy from which the change was made was not accessible at the time of review. The auditor was informed that changes rarely occurred, and that the records could be found if necessary. The reviewer sought to verify that the electronic change was included in the hard copy record, and also to see the original data.

Recommendation: Any changes to electronic data should kept in a bound logbook, and traceable to the hard copy data e.g., with a serial number or date of analyses and project.

Operations Planning and Assessment (OPA)

OPA's primary responsibility is to perform the lead function for Special Purpose Monitoring (SPM) projects. This function entails the planning and coordination of projects, working with affected stakeholders, developing data quality objectives for the SPM projects, tracking of these projects to ensure they are meeting the QA objectives and detailing how projects are meeting those objectives. OPA performs pre- and post audits for SPM projects. A recent example is the Roseville Railyard project It has also performed quality control review and method development reviews of the Northern and Southern Laboratory Program.

OPA Quality Assurance Findings

Finding OPA1: OPA's QA audit role in the organization is underutilized and could be more effective.

Discussion: OPA's has conducted quality control review and method development reviews of the Northern and Southern Laboratory Program. Results of these reviews are not formalized but verbally reported at the Division Chief level. A corrective action plan is not required even if findings requiring action are made. OPA staff stated that as a result of these reviews, classical QA procedures are now being implemented, whereas they were not prior to review. However the QA procedures being implemented were not clearly defined by OPA.

Recommendation: Expand OPA's authority to include self assessments of the QMB and its effectiveness e.g., data production (field and lab), data handling and management activities within the QMB, performance audits conducted by the ARB, and Standards Laboratory calibration activities – areas that are critical for ensuring the quality of ARB-MLD and Districts data. Understanding and comprehensively evaluating how these functions are performed and interaction within the organization is necessary for determining the effectiveness of the existing QA system.

Finding OPA2: Special Purpose Monitoring (SPM) projects are not implemented under a Quality Assurance Project Plan (QAPP), but a protocol developed specifically for the SPM.

Discussion: We credit the ARB for developing data collection protocols specifically tailored to the SPM. The contents of a protocol we reviewed as part of this TSA, "Freeway-Based Diesel Particulate Matter Signature Study", is relatively consistent with what is contained in a QAPP. However, it is not clear from the topics covered how QAPP objectives for sample collection and handling are met.

EPA requires organizations that receive Federal funding to collect and produce environmental data to establish QAPPs that include sample collection and handling procedures. The purpose of the QAPP is to ensure the data produced is of known and documented quality that can be used for its intended purpose.

Recommendation: It is recommended that the SPM protocols be developed consistent with elements contained in a QAPP, to include sample collection and handling. It is also suggested that a crosswalk be developed linking the SPM protocol to the QAPP element it corresponds, to ensure all elements are captured.

APPENDIX A

SUMMARY OF REPORT FINDINGS

MAJOR FINDINGS

Finding M1: The ARB Primary Quality Assurance Organization does not meet the requirements in 40 CFR Part 58, Appendix A, Section 3.1 for its dependent Districts.

Finding M2: There is no central organization that ensures Districts are aware of and follow changes to the QA Manual and related SOPs.

Finding M3: The ARB PQAO has a corrective action process in its QA Manual, but it is not being applied outside the Quality Management Branch (QMB) performance audit program.

Finding M4: The ARB collects environmental data for EPA decision making that is funded in whole or part by EPA but is not subject to the requirements of the ARB and EPA quality assurance programs.

Finding M5: Districts that are part of the ARB PQAO collect data for EPA decision making and/or funded by EPA that is not quality assured by the ARB PQAO.

Finding M6: The ARB QA Manual does not fully meet EPA's QMP and QAPP requirements.

Finding M7: Consistent procedures are not used to validate data.

Finding M8: EPA commends the ARB MLD for producing Quality Assessment Reports and recommends that the ARB PQAO develop a mechanism to use these reports to make specific corrective actions or other quality improvements.

NETWORK MANAGEMENT

Finding NM1: The ARB annual network plan includes not just active monitoring sites but any monitoring site that collected air pollution data in the State of California since the early 1970's, whether still in operation or not.

Finding NM2: The Stockton MSA in the San Joaquin Valley Air Basin does not meet the minimum SLAMS monitoring requirements for PM2.5.

Finding NM3: The Modesto MSA in the San Joaquin Valley Air Basin does not meet the minimum SLAMS monitoring requirements for PM2.5.

Finding NM4: The Red Bluff MSA in the Sacrament Valley Air Basin does not meet the minimum SLAMS monitoring requirements for ozone.

Finding NM5: The Visalia-Porterville MSA in the San Joaquin Valley Air Basin does not meet the minimum SLAMS monitoring requirements for ozone.

Finding NM6: Some information in the ARB State and Local Air Monitoring Network Plan, dated June 2007, does not agree with information in the EPA AQS database or with local district Annual Network Plans. The specific examples noted in the discussion to this finding may or may not constitute the actual total number of inconsistencies in the 2007 plan.

Finding NM7: The ARB 2007 Network Plan is not complete with respect to GBUAPCD sites, monitoring objectives or monitoring scales.

OPERATIONS

Finding AQSB1: Field operators do not always document shipping information on their sample report/tracking sheets. See also Lab Finding #IL7

Finding AQSB2: Some ARB MLD monitoring SOPs are outdated and/or incomplete.

Finding AQSB3: White out was noted on an MLD air monitoring form.

Finding AQSB4: ARB MLD does not calibrate monitoring equipment at all PQAO sites.

Finding AQSB5: Second level review of calibration records and calculations is not routinely done.

Finding AQSB6: The lowest ozone calibration point is at a concentration that is above the 8 hour standard.

Finding AQSB7: The calibration technician noted that only 2 gas phase titration points are used to verify the NO2 calibration.

Finding AQSB8: Maintenance and performance verification of zero air scrubbers used for calibrations is not documented.

Finding AQSB9: The Special Purpose Monitoring Section should keep EPA informed of its monitoring projects.

Finding AQSB9: The trees to the east of the Fresno 1st Street station building are about 15 meters from the inlet probe and PM manual instruments.

Finding AQSB10: At the Stockton-Hazelton monitoring station, a large tree to the south of the trailer is acting as an obstruction for the gaseous pollutant sample train inlet as well as to the PM10 and PM2.5 samplers. This site does not meet the probe siting criteria in 40 CFR 58, Appendix E.

Finding AQSB11: The palm tree northwest of the Visalia monitoring station is within 10 meters of the inlet probe.

Finding SJV1: The San Joaquin Valley APCD does not have District specific SOPs addressing the operation and maintenance of its air pollution monitoring network.

Finding SJV2: The SJVAPCD field operators do not maintain zero and span or precision check control charts.

Finding SJV3: Station and instrument logbooks are not reviewed by the Supervising Air Quality Instrument Technician.

Finding SJV4: There is no current, consistent procedure in place for archiving all station records.

Finding SJV5: At the Bakersfield – Golden State Highway site, the area surrounding the trailer which houses the monitoring equipment needs to be stabilized.

Finding NS1: The NSAQMD field technicians have instrument manuals but not SOPs. The ARB SOPs are only kept at the District's main office in Grass Valley and are not at field stations. Additionally, the District operations deviate from the ARB SOPs but do not document those deviations.

Finding NS2: The NSAQMD record-keeping procedures need to be more rigorous.

Finding NS3: The NSAQMD experiences significant ozone data loss due to a lack of spare parts.

Finding NS4: ARB performed audits of the NSAQMD PM instruments do not conform to CFR requirements. Additionally, the NSAQMD stated that the ARB does not perform through the probe audits of NSAQMD ozone monitors.

Finding NS5: There is no feedback from the ARB on outcome of PM filters. See also Laboratory Finding # IL8

Finding NS6: The most recent ARB site survey report was not accurate.

Finding NS7: The NSAQMD does not utilize strip chart backup for its ozone instruments.

Finding NS8: There are trees within 20 m of monitors.

Finding GB1: Great Basin operates an independent monitoring, laboratory and QA program from that of ARB.

Finding GB2: GBUAPCD's Training program (a QA function) is independent and separate from that of ARB.

Finding GB3: Logbooks were not all up to date and signed by the GBUAPCD operators at all stations.

LABORATORY OPERATIONS

Inorganic Laboratory

Finding IL1: The MLD weigh sessions have been automated in a manner that reduces the possibility of operator error.

Finding IL2: Mass determination of PM10 filters should include blank controls.

Finding IL3: Temperature and humidity measurements in the weigh rooms are only logged on a paper chart and are not formally analyzed to determine compliance with regulatory criteria.

Finding IL4: The PM10 laboratory only recently started a logbook to track verification of "working" mass standards.

Finding IL5: Several additional improvements could be made to the PM2.5 weighing process.

Finding IL6: The PM10 and PM2.5 documentation and archived filters were well organized and easily tracked.

Finding IL7: Field operators do not always document shipping information on their sample report/tracking sheets. See also Operations Finding #AQSB1.

Finding IL8: A local District stated that there was lack of sufficient feedback from the ARB on outcome of PM filters. See also Operations Finding #NS8.

Organic Laboratory

Aldeydes and Methyl Ethyl Ketone (MEK) by High Performance Liquid Chromatography (HPLC)

Finding OL1: A second source quality control standard is not being analyzed as required by the method. Analysis of a second standard is being performed but the standard is not prepared from a second stand source and is prepared as a dilution of the same standard solution that is used to prepare the working calibration standards.

Finding OL2: Audit samples are not being analyzed.

Finding OL3: Field blanks are not being analyzed. Sample results are being corrected for background contamination based on an average background contamination of 0.3

:g/cartridge determined from a field blank study performed by MLD 15 years ago. It is the understanding of the audit team that field blanks have not been deployed for 15 years.

Finding OL4: The laboratory is not using an internal standard method of analysis as described by the method. The laboratory is currently using the external standard method of standardization.

Finding OL5: Secondary review of instrument logbooks is not being documented.

Hexavalent Chromium by Ion Chromatography (IC)

Finding OL6: Audit samples are not being analyzed. The audit team was told that the ARB QA Department suggested the department initiate its own system of audit sample analysis.

Finding OL7: Secondary review of instrument logbooks is not being documented.

Finding OL8: It is noted that the laboratory is looking into the purchase of an additional IC.

Finding OL9: Secondary review of instrument logbooks is not being documented.

Aromatic and Halogenated Hydrocarbons by Gas Chromatography/Mass Spectrometry (GC/MS)

Finding OL10: Duplicate samples are being analyzed and presented as tabulated results in quarterly QA reports but control charting is only occasionally performed.

Finding OL11: The GC/MS is not vented to outside the facility.

Finding OL12: Secondary review of instrument logbooks is not being documented.

Oxygenated Hydrocarbons and Nitriles

Finding OL13: Audit samples are not currently being analyzed.

Finding OL14: GC/MS Saturn D is a new instrument which was brought on-line in April, 2007 that is being used to generated data but an MDL study has not been performed and documented.

Finding OL15: Although the MLD 066 method is based on the TO-15 method which describes and internal standard method of calibration, the laboratory is using an external method of standardization and internal standards are not being used.

Finding OL16: Secondary review of instrument logbooks is not being documented.

Finding OL17: Mass calibration is being achieved with perfluorotributylamine (FC -43) but confirmation of that tuning abundance criteria have been met is not being verified through the analysis of 1-bromo-4fluorobenzene (BFB). It is the understanding of the audit team that tentatively identified compounds are not routinely being reported with this method.

Finding OL18: The GC/MS is not vented to outside the facility.

Canister Cleaning & Certification

Finding OL19: Laboratory staff stated a random pull of canisters for certification testing is performed. The laboratory does not take into consideration which canisters had the highest concentrations of contaminants prior to cleaning when deciding which canister in each batch to test for cleanliness certification.

Finding OL20: Canisters are not vented in hoods and are vented to ambient air.

Finding OL21: The laboratory has not established a retention time for canisters after they have been certified. The laboratory relies on the canister pressure gauge reading as an indication the canisters have not lost vacuum.

DATA MANAGEMENT

Finding DM1: The data validation and review/verification procedures for the Air Quality Surveillance Branch are not formally published in a control-copied SOP.

Finding DM2: The data validation and data review/verification procedures for the Northern Laboratory Branch are not formally published in control-copied SOPs.

Finding DM3: The data validation and data review/verification procedures for the Air Quality Data Section are not formally published in a control-copied SOP.

Finding DM4: EPA was not given access to special projects data management activities to review. It is not clear that QA procedures apply to all projects receiving federal funding.

Finding DM5: The AQDS does not ensure that local District data is validated prior to upload to AQS.

Finding DM6: Ambient monitoring data submitted to the AQS database by the ARB PQAO is not being annually certified.

Finding DM7: Staff do not have free access to surface communication concerns related to quality assurance to maximize organization efficiencies.

Finding DM8: Valid concentration data for the Yreka PM2.5 monitor (AQS# 06-093-2001) have not been submitted to the AQS database since December 2006.

Finding DM9: The AQS database identifies the Siskiyou County APCD as its own PQAO.

Finding DM10: The Lakeport PM10 site has not reported PM10 data correctly to AQS since March 2001.

QUALITY ASSURANCE

Finding QM1: The QMB does not have the authority in the organization to provide direction and recommendations to the data collection, production, and verification programs.

Finding QM2: Training, while in place for the ARB MLD, does not necessarily extend to all staff and the ARB PQAO Districts. See also Finding M1.

Finding QM3: Some Districts do not have a central, independent, dedicated quality assurance manager/officer responsible for communicating and ensuring that quality assurance activities are carried out in field operations and information management.

Finding QA1: The QAS does not assure that sites that fail performance audits are re-tested after a corrective action is implemented.

Finding QA2: The QAS has experienced a high staff turnover in recent years, which has impacted the level of institutional knowledge in the section and impacted their ability to perform audits.

Finding QA3: System audits of local Districts by QAS and the Stationary Source Division are only conducted by request or on an as needed basis.

Finding QA4: ARB MLD does not perform routine audits of data quality.

Finding QA5: Internal audits are not conducted on ARB-MLD's and Districts data management, reduction and review process.

Finding QA6: The ARB's MLD does not routinely conduct monthly (day-to-day) checks of all the precision and accuracy of data being uploaded by the local Districts to the AQS database.

Finding QA7: The ARB Reporting Organization (RO) cannot access the AQS accounts of Districts that are part of the ARB PQAO, but are their own RO for the purposes of uploading data to the EPA AQS database.

Finding SL1: There is no corrective action procedure in place to notify Quality Assurance or Field Audit staff of failure i.e., potential rejection of data from period prior to calibration check taking place when transfer and flow standards fail calibration.

Finding SL2: The thermometer in the Standards Laboratory needs to be verified with another NIST traceable standard.

Finding SL3: There is insufficient documentation in logbook entries in the ozone Standards Laboratory.

Finding SL4: Calibration of the primary flow standards brought in by ARB staff or District does not always occur on an annual basis. There is no tracking by the Standard Laboratory to ensure District or ARB flow standards are annually recertified.

Finding SL5: Manometers were not calibrated separately from transfer standards.

Finding SL6: The control charts for Hi Vol flow standard was above two standard deviations from approximately September 2005 and reached three standard deviation at approximately January 2006, before corrective measures were taken to bring it back into control.

Finding SL7: The Standards Lab's High Volume Orifice Calibration Work Sheet is not always filled out completely. Similarly with logbooks, the person performing calibrations for the ozone standards is not recorded.

Finding SL8: Calibration records from DH Instruments, Inc. are not always opened upon receipt.

Finding SL9: The Standard Laboratory does not maintain calibration verification records it performed on instruments recalibrated by DH Instruments.

Finding SL10: There is no backup to the stand alone DBASE database server that maintains records from results of calibrations performed of District and ARB-MLD sites.

Finding SL11: Hard copy records of changes made to DBASE electronic data (see comment 10 above) is not easily accessible.

Finding OPA1: OPA's QA audit role in the organization is underutilized and could be more effective.

Finding OPA2: Special Purpose Monitoring (SPM) projects are not implemented under a Quality Assurance Project Plan (QAPP), but a protocol developed specifically for the SPM.

APPENDIX B

CALIFORNIA METROPOLITAN STATICAL AREAS AND MINIMUM MONITORING REQUIREMENTS